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**NITRO DUAL
SPORT**



THE WORLD'S LEADING R/C CAR MAGAZINE

September 1998

**Nitro or
electric**
Which is best?

**YOKOMO
MX-4**

PLUS
**AIRBRUSH
BASICS**
**MOTOR
MAINTENANCE**
**REEDY RACE
OF CHAMPIONS**
SCHUMACHER FIREBLADE
FSR BULLET

20 SPEEDOS
REVERSING ESC GUIDE



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ON THE COVER: (top to bottom): Associated Nitro Dual Sport; Yokomo MX-4; Novak Super Rooster. (Photos by Walter Sidas.)

Accept the challenge!

For this hobbyist, part of R/C's great appeal is the constant challenge: the challenge of building a better car, painting a snazzier body, driving a faster race You know what I mean. There's one challenge I'm faced with every time I walk into a hobby store with money to burn: the challenge of *choosing*. Everybody wants to make sure he gets the right equipment. Which car? Charger? Motor? We can't pick all those items for you, but if you're in the market for a reversing ESC, your shopping job just got a lot easier. We've collected 20 reversing ESCs and gathered all their specs in our **Reversing ESC Guide** so you can choose the unit that's right for you. As usual, there are extra helpful hints and how-to info as well. It's the perfect opportunity to kiss that mechanical speed control goodbye!



Speaking of choices, you might be weighing the option of buying a nitro or an electric vehicle even as you read this. Great timing: Steve Pond takes on the eternal question (which is better?) with his **Nitro versus Electric**



feature. Yes, Steve reveals which is flat-out fastest! However, there's a lot more to the nitro-or-electric quandary, and all is explained—right down to maintenance needs, out-of-the-box expense and cost of operation—a must-read for the new car buyer. And be sure to check out “Chris’s Back Lot” for a ... shall

we say ... “alternative” take on the issue.

Of course, you probably already have a car or two if you're reading *R/C Car Action*. Would you like your cars to look extra trick, thanks to your best-ever paint job? An airbrush is the key, but basic know-how can be tough to come by. Our resident Picasso of plastic, Greg Vogel, has condensed all the stuff you gotta know to get started into **Airbrush Basics**. If you're tired of being Mr. Monochrome, this is all you!



Last, but certainly not least, the Worlds-winning **Yokomo MX-4** bursts across the pages of *R/C Car Action* as the premier “Thrash Test” of the issue. Other cutting-edge electrics in this issue include the innovative FSR Bullet and Schumacher's newly reconfigured 2WD buggy, the Fireblade USA. For nitro guys, Associated's gas-guzzling version of its RC10DS hits the street for your reading and viewing pleasure.

Enjoy. Until next time, keep the Lexan side up.

Peter Vieira

Peter Vieira
Editor

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I Want Joel Johnson's Car

On page 130 of your July '98 issue, there was a write-up on Joel Johnson's ROAR Nats-winning Street Weapon. You mentioned that many of the parts that Joel used to win might soon be available (I'm mainly interested in all those suspension parts that change the front caster angle down to 2 degrees). Any info you could pass along would be greatly appreciated. Just so you know: I own both a Losi XX-4 buggy and a Street Weapon sedan and think they're the best cars ever produced. P.S.—So Cal Raceway rules!

CARL THOMPSON
Huntington Beach, CA

You're in luck, Carl, because Team Losi has just announced that it will be releasing several new performance-enhancing parts for the Street Weapon touring car. These parts are the result of months of testing with the Team Losi Racing team, and yes: a new front bulkhead and new 3-degree caster blocks are part of the picture. Check out the "Speed Shop" section of "Racer News" in this issue for more details. Oh, and I agree; So Cal is an awesome racetrack. —G-Man

Back on the Chain Gang

I'm getting a Bolink Legends coupe. Which motor, electronics and gearing would you recommend? Where could I get a chain drive (instead of a belt drive) conversion for my RS4 MT? Would that give me the same performance? [email]
SPEEDY 2

Speedy, you won't find chain drives in R/C cars any more (aftermarket or otherwise), simply because belts are much, much better. They won't break as

easily, they're more efficient, and they're just plain easier to live with. As for that Legends car, I suggest you get a Legends motor, a Legends battery, an inexpensive forward-only ESC (any name brand is fine) and stick with the pinion and spur included with the kit. With the stuff I've listed,

you'll be legal to race at any track that supports the Legends class. For general play (and faster speeds), get a couple of inexpensive 6-cell stick packs such as Trinity Thunder Sports or DuraTrax Piranhas. Legends cars are quite light, so expect plenty of scoot from those stick packs! If racing isn't a concern, think about getting a reversing ESC for convenience and stunt-driving fun (what a coincidence; we have a giant guide to reversing ESCs in this issue). —Pete

Get Real

Don't you think this hobby is just a bit too expensive? I would love to get into R/C racing but the cost is just way too high. Paying anywhere from \$300 to \$500 (or even more!) for a little car that will only run for about 5 to 6 minutes is simply outrageous. I have driven an R/C car before and agree that it is a lot of fun, but it is by no means worth that much money! If manufacturers really wanted to promote this hobby, they would consider charging a fair price instead of trying to fill their pockets with money. But I guess that is to be expected of today's companies. [email]
NO NAME GIVEN

I'm not going to try to change your mind if you don't feel R/C is for you, but you're way off base on every point you try to make. First of all, \$300 to \$500 can buy you everything you need to race—not just the car. True, a racecar does run for only 5 or 6 minutes (when geared for racing), but it's not as if the car is useless after the batteries die; they're rechargeable, remember? More important, the R/C car hobby isn't about simply

running the cars. I've spent countless hours tinkering, tuning and rebuilding my cars just for the pleasure of it. If the only appeal of R/C for you is running the car, stick with an R/C toy. Last, and most troubling, your final remark that manufacturers simply want to "fill their pockets with money":

totally incorrect. There are successful companies in R/C, but they earned that success with hard work—not inflated pricing. It requires a ton of money to bring an R/C car to market, and the market is a small one; considering the expense of other types of niche hobbies/sports, R/C cars should cost *more*. But R/C cars *don't* cost more; in fact, prices have stayed the same or have even fallen as the equipment has steadily *improved*. Ten years ago, a prominent mail-order house advertised Team Losi's JR-X2 for \$189.95. In the August '98 issue of *R/C Car Action*, the same company offered Team Losi's Double-X 'CR' (the performance of which is light-years beyond that of the JR-X2) for \$182.99; so much for pocket-filling. —Pete

Tamiya's Laying it Down—in 1/8 scale

Is it true that Tamiya is going to release a new 1/10-scale gas touring car that's made for the new O.S. .12LD engine? In Chris Chianelli's "Inside Scoop" in the July issue, a Tamiya car was shown that looked a lot like the 1/8-scale TGX-Mk.1 and, ironically, it has the same title, except—as you reported—it's a 1/10-scale version. What gives?
YOSHI NAKIYAMA
Albany, NY

Yoshi, the car that you saw in "Inside Scoop" was actually a new version of the 1/8-scale Tamiya TGX. This new car has been slightly modified to accept the O.S. .12LD (laydown) engine and is called the TGX-Mk.1 TS in Japan. Unfortunately, we referred to the car as a 1/10-scale version when it was actually an 1/8-scale car all along. Sorry we got your hopes up, but you never know what Tamiya will have in store for us in the future. —G-Man

WRITE TO US! We welcome your photos, drawings, comments and suggestions. Letters should be addressed to "Letters," Air Age Inc., *Radio Control Car Action*, 100 East Ridge, Ridgefield, CT 06877-4606. Letters may be edited for clarity and brevity, and each must include a full name and address or telephone number so that the identity of the sender can be verified. We regret that, owing to the tremendous numbers of letters we receive, we can't respond to every one.

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The TAO2 Lives On

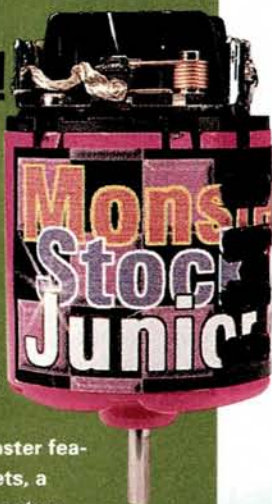
Hey guys (and gals), I just wanted to drop you a line to tell you that you have the greatest magazine in the world. I completely wear out each issue and desperately wait each month for a new dose of *R/C Car Action*. Now for my question: I saw an ad in the July '98 issue that featured a gas conversion kit for the Tamiya TAO2. I have a wildly hopped-up TAO2 that has been retired ever since I purchased a TAO3F-Pro Dave Jun Special. It sure would be great to give my o2 a new lease on life, and it looks like this conversion kit might be just what it needs. Have you had any experience with this conversion kit, and do you know if I'll be able to use any of the hop-ups that are on the car now?

RICHARD DE MONTEROS
Gardena, CA

Richard, you can always get a dose of *R/C Car Action* between issues at our website, www.airage.com/rcca. Now, let's talk about the Thunder Tiger TAO2 Gas Conversion Kit. The conversion kit comes complete with an engine, so everything you'll need to convert your TAO2 to a lean, mean, nitro machine is included. You didn't mention which hop-ups you have on your car now, so it would be very difficult to determine whether they'll work on the converted car. Most of the TAO2 suspension hop-ups should work with the conversion, since it uses the stock TAO2 suspension. If you would like a more definitive answer, give Thunder Tiger a call at (660) 584-7121. I suspect you'll have a noisier TAO2 very soon! —G-Man

TRINITY UNLEASHES
ANOTHER
MONSTER!

The latest Trinity mill to bear the "Monster" moniker is the Monster Stock Junior 4 Pro. In addition to the Midnight 2's trademark flat-can design, this 27-turn/36-degree Monster features 6V wet magnets, a short-stack solid armature blank and stand-up brushes. Trinity even dyno-tunes each and every motor to ensure optimum performance, and each comes packaged in a motor tube with dyno sheet.



No welding required

So, you'd like to have a tube-frame monster truck like Hector Aponte's Mongoose (see "Homebuilt Project: Mongoose Monster Truck," page 100, February 1998 issue), but you aren't exactly a master craftsman with the welding rod? Check out this monster from New Era. This machine features a completely heli-arc-welded, tubular 4130 chromoly chassis (that's what BMX bikes are made of). The chassis uses familiar Tamiya Clod Buster parts and is available with or without the removable cab area shown here (man, you gotta get the cab). The kit can be assembled with 2- or 4-wheel steering, and New Era offers plenty of accessories, such as a long-wheelbase kit, swaybars, front bumper and more. The 120mm shocks are also from New Era.

Less rotating weight
for your HPI RS4

Trinity's new lightweight spur-gear mount for all slipper-less HPI RS4 vehicles trims 2 grams from the stock HPI part and runs super-true for a wobble-free spur gear. Every little bit of weight you can trim from a car helps, but rotating parts really benefit from any weight savings. Pair Trinity's spur mount with one of their Zero Gravity spurs for a super high-performance, low-weight package.



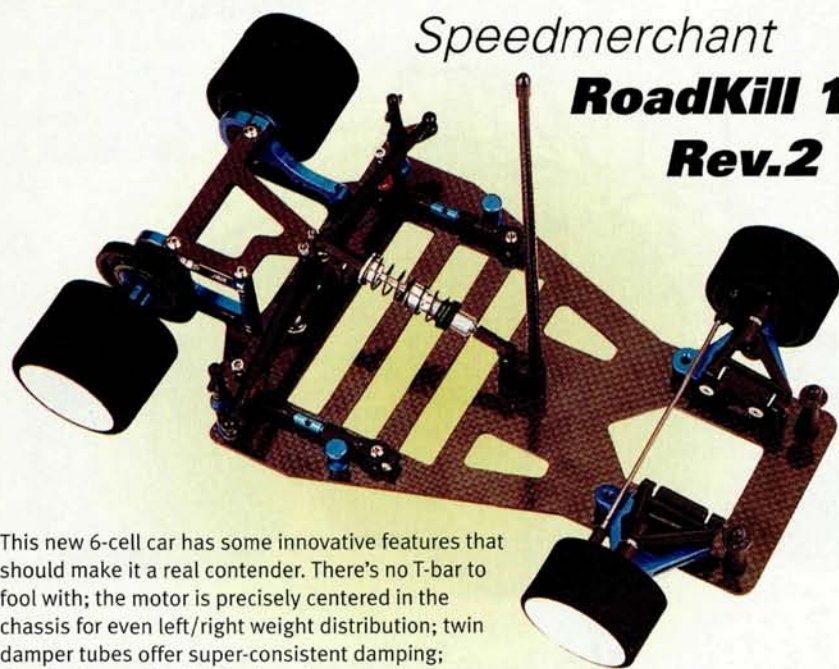
NEW RPM HOOPS FOR YOUR SEDAN—LOSI STREET WEAPON, TOO!

I'll go on the record with this: nobody does chrome wheels like RPM. With mirror-bright finishes and killer designs, RPM wheels allow you to bolt on instant cool. Two new styles have just been popped out of the molds: the directional Turbo (right) and the beefy 10-spoke Striker. Like all RPM sedan wheels, the Turbo and Striker designs fit any touring car with 12mm hex hubs (which is most cars) and include spacers to fine-tune your car's width.



Did I mention the Street Weapon? Oh, yeah. If you'd like to put the new RPM wheels or any other 12mm hex-type rims on your Team Losi tourer, RPM's new Street Weapon adapters can make it happen. Your SW will be slightly wider after the installation, so expect a more muscular stance to accompany those cool wheels when you have everything bolted together.

Speedmerchant **RoadKill 12 Rev.2**



This new 6-cell car has some innovative features that should make it a real contender. There's no T-bar to fool with; the motor is precisely centered in the chassis for even left/right weight distribution; twin damper tubes offer super-consistent damping; there's plenty of soldering-iron clearance in the rear pod, and a no-tape O-ring battery-retention system makes the RoadKill fast on the bench. RoadKill? Interesting name. Question is: is that what this car will leave behind ... or end up as? We'll do a full test soon and let you know.

DYNAMITE ADDS NUT DRIVERS TO PRO TOOL LINE

Great; just when I thought I had completed my Dynamite hex-driver collection, they go and release this nut driver line. Well, something in the household budget will have to give. The groceries will wait! The new drivers feature handles whose diameters are keyed to the nut sizes, so you get more torque on larger nuts and less on smaller nuts on which the threads might strip. The red-anodized handles are engraved with the driver diameter and, for easy identification, the shafts get longer (1/4 inch each time) as the driver diameter increases. Available in standard sizes from 3/16 to 3/8 inch and in metric versions for 5.5 and 7mm nuts.

Joel Johnson VIS EX-TRA Team Edition RC-2000



'98 ROAR INDOOR TOURING CAR NATIONAL CHAMPION

Joel Also Used:

TK3001, \$17.99	Steering Ball Bearings
TK3009, \$8.99	Blue Anodized Rear Suspension Brace
TK3012, \$19.99	Blue Anodized Motor Mount Clamp
TK3025, \$12.99	Blue Anodized Servo Mount
TK3028, \$23.99	Blue Monster Motor Heat Sink
TK3033, \$5.99	Foam Bumper
TK3040, \$10.99	64 Pitch Gear Adapter
TK3037, \$3.99	Purple Congo Shock Springs, (.065)
RC7100, \$3.50	100 Weight Trinity Silicone Shock Oil
RC6073, \$8.99	Touring Car Tire Tamer

TRINITY

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Dirtinator 3 Modified Street Weapon Trinity

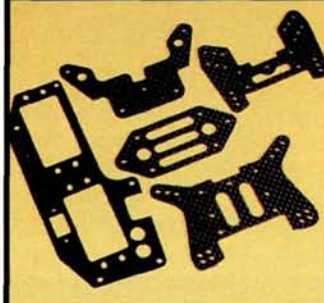


HPI goes rally

Well hellooooo ... what do we have here? HPI unveiled its new RS4 Rally car, which appears to be a class-making design. It features a fiberglass chassis and dual belt drive (from the RS4 Sport), a Lexan undertray and interior shell to keep crud out (like the RS4 MT's), new rally-pattern tires, extra-high ground clearance and long-travel shocks, a new rally body and a new curved front bumper (not shown here) for real off-road action. This isn't just a rally-looking car that's best left to the pavement; this machine looks like it can hit the dirt!



FACTORY HOP-UPS FOR PRIME 12 AND SUPER ATHLETE



Nothing fits as well as factory stuff, and Mugen has you covered with go-fast goodies for your Prime 12 Tourer and Super Athlete 1/8-scale buggy. For the Athlete, carbon-fiber shock towers, radio tray, front brace and center diff top plate add strength, reduce weight and look great, too. The Prime 12 gets some very effective performance-enhancing hop-ups (heck, they're performance-transforming) in the form of a tuned pipe and manifold, 2-speed transmission, super-sticky slick tires and a foam bumper. I know; the bumper seems kind of pedestrian compared to the trick pipe and tranny, but believe me, if you get the pipe and 2-speed, you'll want to have that bumper!



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SPEED COUNTS

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So they sent editor Peter Vieira to Japan! Like I care! I didn't even want to go. And anyway, I'm off to South America in a couple of weeks—so there! I'm happy to turn this hallowed spot over to him—just once. Neat stuff!—Chris



Big in Japan

The newest stuff from the '98 Shizuoka Hobby Show by Peter Vieira

Japan. Some might think of the Land of the Rising Sun as simply the home of Mount Fuji, the world center for consumer electronics, or (for you pop-culture types) stomping fodder for Godzilla. For an R/C guy like me, however, Japan represents the epicenter of the whole R/C car scene. If it's new, it's in Japan—specifically, Shizuoka, the site of the 1998 Shizuoka Hobby Show. Needless to say, I jumped at the chance to visit this R/C mecca—and I took a camera.



YOKOMO GETS IN ON THE RALLY ACT, TOO. Yep; this rally thing is taking off now. Yokomo displayed its own rally prototype with dirt-deflecting Lexan shields. From the looks of the show prototype, the MR-4 is basically a narrowed, rally-body MX-4. I sense an HPI-vs.-Yokomo rally shootout coming on



LARO OF TOMORROW?

No word yet on stateside distribution, but this inboard-shock-equipped Laro 1/8-scale buggy was spotted in the booth of a Japanese distributor. Note the upside-down rear shocks. As we get more info, you'll get more info.

TAKE CHARGE! KO was showing its innovative, linked charger and discharger system. The stacking design makes for easy cycling without taking up too much pit space. There's a built-in cooling fan on the discharger, and both units feature adjustable amperage with digital displays. Look for a "Product Watch" on the system soon.



NEW TAMIYA STUFF! Tamiya had the largest booth at the show, and it was full of cool stuff, including a carpet track with a "quarter pipe" banked wall, a giant Mini 4WD track, tons of incredible scale models and some wacky custom creations. Here are the highlights



UNNATURAL ACTS OF R/C. Check out these Frankenstein creations. First, we have a "dust-buster" Voltec Fighter; suddenly, housework seems a lot more interesting. Next, a ski-and-track-equipped King Hauler for when the load just has to get through—through Siberia, that is. The third Tamutation is this off-roadified Mercedes SLK, which sports Blazing Star suspension arms and a motor at each end of the chassis. Kind of makes you want to hit the bench and start tinkering, doesn't it?

NEW M-CHASSIS REVEALED. Tamiya unveiled this new M03 chassis, which still incorporates a clamshell tub design but updates the suspension setup with a friction shock at each corner—no more monoshocks and sprung suspension arms! The steering servo is directly linked to the front hubs, so there's no more bellcrank slop. I drove one on the carpet track in Tamiya's expansive booth. It handles!

On consumer day, crowds pressed against Tamiya's test track to check out the action. Here, a couple of tractor trailers are demo'd.



These are for real—clear shocks! When they're filled with tinted shock oil, you'll never need to guess how your dampers are set up, and you'll see which pistons are in there. You'll even see the bladder doing its volume-compensatin' thing. Very trick indeed.



Tamiya's Mini 4WDs clattered endlessly around this giant track. The little cars are addictive; I got bitten by the bug myself.



READERS'

rides

"Readers' Rides" is our way of recognizing the unique, innovative—and sometimes bizarre!—vehicles that our readers have created. Send us a sharp, uncluttered, well-exposed color photo of your car or truck (no Polaroids, please!), along with a brief description, to Readers' Rides, R/C Car Action, 100 East Ridge, Ridgefield, CT 06877-4606. If we choose to feature your creation, you'll receive a 6-month subscription to R/C Car Action, or an extension of your existing subscription. You'll also be eligible for the eighth annual "Readers' Rides of the Year Contest" in the fall of 1998. In case we need to contact you, write your address and phone number on your letter and on the back of every photo you send. Good luck!



2-in-1 Truck

Frank Jaksties of Port Orange, FL, has an RC10 GT and a Nitro DS—but can only run one at a time! Frank originally bought a GT to run in the dirt, but when he became interested in parking-lot racing, he bought a DS conversion kit so he could switch the GT to an asphalt racer. His ride is powered by an O.S. CV engine and uses Futaba radio gear. When in DS mode, the car uses a custom-painted Dahm's Porsche body.



Never-ending Add-ons

This hot Losi XX-T comes from Jesse Gonzalez of Independence, MO. Jesse has spent a lot of time and money hopping up his truck with parts from Trinity, RPM, MIP and Losi. Losi add-ons include a "CR" suspension kit, aluminum motor plate, dogbones and battery brace. Trinity's front and rear braces add strength, while MIP light drives and shock shafts improve performance, and an RPM gear cover protects the gears from dirt and debris. An Airtronics radio controls a Futaba steering servo and a Novak Tempest ESC. ESP batteries and a Litespeed motor provide the power. Looks good.



Hardcore Honda

Chris Brodit of Hercules, CA, enjoys racing his Sparco Honda Civic with friends in parking lots. The front-wheel-drive Tamiya car features an HPI graphite chassis, Kose front and rear lower arms, reinforcement bar, steering kit and dogbones. A Tech Racing stabilizer kit keeps the car planted on the ground, and it's powered by Futaba, Novak and Trinity electronic gear.



Canadian Contender

Benoit Perigny of LaTuque, Quebec, Canada, owns this Losi Double-X buggy. The car is equipped with a Trinity purple screw set, Lunsford titanium turnbuckles, Losi 5-spoke rims and Litespeed connectors. A Futaba Magnum Junior controls a Tekin Formula 10 ESC and Trinity Buggyweld motor. The power comes from a Panasonic 1800 battery pack, and the body was painted with Pactra spray paint.

Tamiya Weight-Loss Program

Joseph Claridades of Chatswood, Australia, is on a mission to drop his TAO3F Pro from 1,600+ grams to an even 1,400 grams. When Joseph sent this photo, his car had been whittled to 1,485 grams. He accomplished this by adding an aftermarket chassis, shock towers, steering, knuckle arms and heat sink, all from GPM. Tamiya hop-ups include special dampers, uprights, torque splitter, ball diffs and drive belt. Tobee parts include the rear axle, countershaft and gearbox joints. The electronics package features a KO Propo radio, Peak motor, Novak ESC and a 2000mAh battery pack.



NASCAR-style Tourer

Michael Sensburg of Langenselbold, Germany, slapped a lot of extra postage on his envelope to send us this picture of his Yokomo YR4. The car is equipped with a JR radio, KO Propo servo, a Novak Hammer ESC and a Reedy TurboStock motor. The body is an HPI Audi A4 with a Goodwrench Earnhardt paint scheme. Michael runs his machine in the budget class, in which only inexpensive tuning options are allowed. Der Intimidator!



Double-Engine Drag

This Parma 32 Hemi Coupe was sent to us by Mark Loblillo of Berwyn, IL. Mark converted the car to nitro power with an O.S. CVX engine, HPI gas tank and Associated clutch bell and spur gears. A homemade wheelie bar keeps the front end down, and the braking is engaged by a steel belt around the clutch bell. Mark says the car is scary-fast but drivable; just point and go!

We don't doubt it.



Electrified Stampede

Rick Logan in Stockton, CA, says his Traxxas is as fast as its paint job suggests. The truck is fitted with a Trinity Speed Gems Jade motor, Tekin Rebel ESC and a Futaba Magnum radio. The truck also features a full set of bearings, a slipper clutch, adjustable turnbuckles, Deans plugs and HPI chrome rims. Rick added chrome accents to the body and custom-made the front and rear skid plates. He says the Stampede will take anything he can dish out.

PIT

workshop ideas & innovations

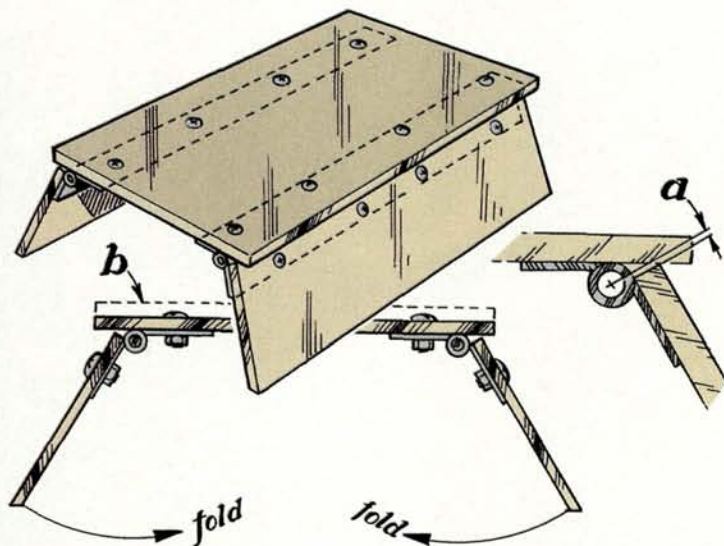
BY JIM
NEWMAN

tips

**Bottled Up**

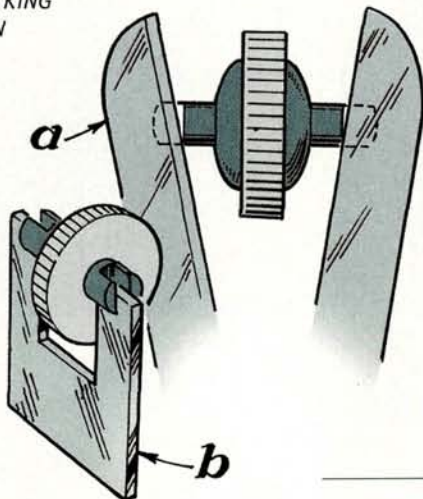
Store your tuned up motors in empty pill containers with snap-on lids. Cut a rubber pad from a shoe insole, place it in the bottom of the container, then drill out the cap so the shaft will keep the motor centered. Some prefer to use a deep container with rubber in the top and bottom so that the motor is totally cushioned.

JUSTIN DIPIETRO
Bridgeville, PA

**Into the Fold**

Make this folding car stand from $\frac{1}{8}$ -inch (3mm) Lexan or birch aircraft plywood. Use low-profile 4-40 button-head screws and stagger their positions so they do not interfere with one another when the stand is folded. The sides are set down on the hinge (a) so that they splay out for stability when the stand is opened out. Glue thin rubber on top (b) to prevent the car from sliding while it's being worked on.

HAROLD KING
Kouts, IN

**Shear Cleverness**

When adjusting a ball differential, a pair of dull scissors (a) can be used to prevent it from turning. Better yet, make this simple tool (b) from sheet metal, which can be held in a vise.

HON LU
Burbank, CA

**Striptease**

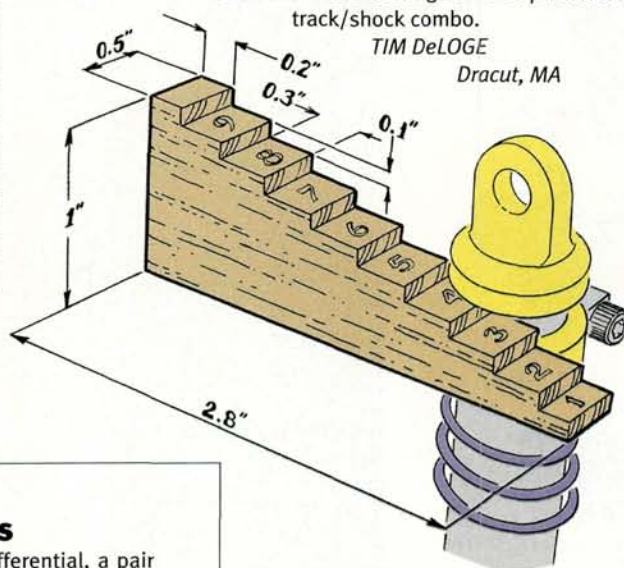
If the threads are stripped from a plastic part, place a short piece of soft copper wire in the hole before you put the screw back in. The wire will force the screw over to one side, where it will cut a new thread. This will last until you can get a new part or make a more permanent fix.

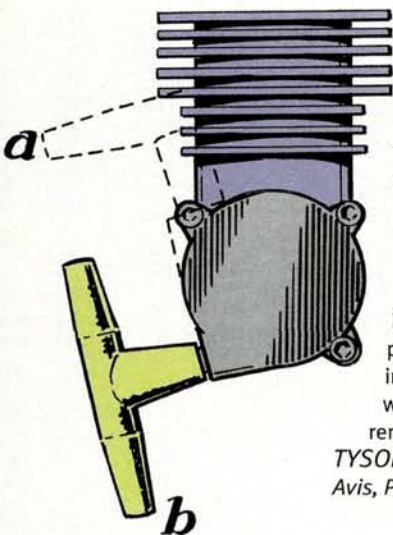
FRASER McMILLAN
Dundonalds, Ayrshire, Scotland

Stepping Out

Make this stepped shock-adjusting gauge from hardwood and use it as shown to ensure accurate shock settings on each side of the car. Steps of $\frac{1}{10}$ inch (2.8mm) allow fine adjustment. It's easy to read and record the setting for that particular track/shock combo.

TIM DeLOGE
Dracut, MA





All Pull Together

Tyson removed his TRX 15 rear screws then rotated the pull-starter housing from (a) around to (b). Now he reaches the pull handle from below and pulls downward, allowing faster pit stops without the need to remove the body.

TYSON HAGEN
Avis, PA



Dirt Devil

You can keep most dirt out of your car by installing these Lexan inner fenders. Be sure you leave sufficient clearance for suspension travel, then stick the fenders into place with Shoe-Goo or dots of hot glue.

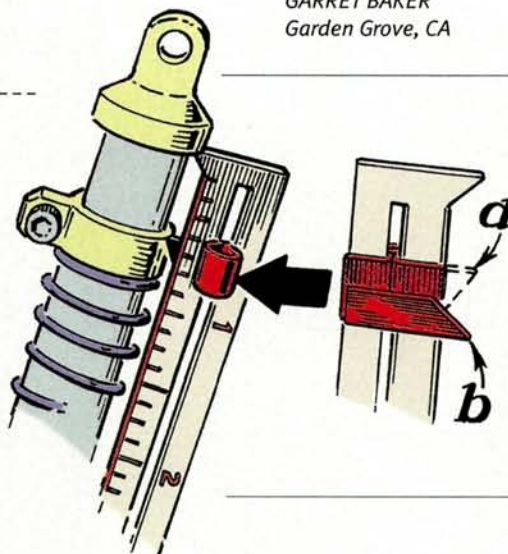
GARRET BAKER
Garden Grove, CA



Spray it Again, Sam

If you lose the spray tube from your motor spray, substitute a plastic-tube coffee stirrer. Just split it in half, and it's a ready fit.

ROLAND MARTINEZ
Loma Linda, CA



Very Near Right

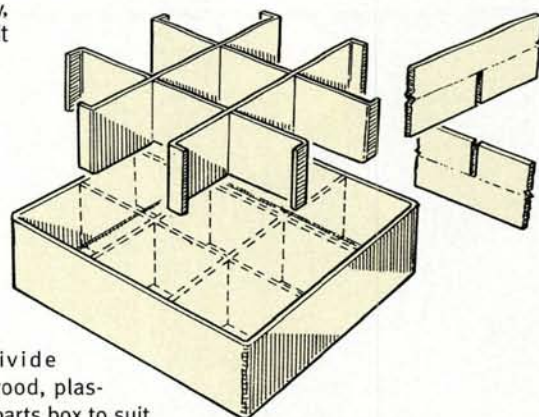
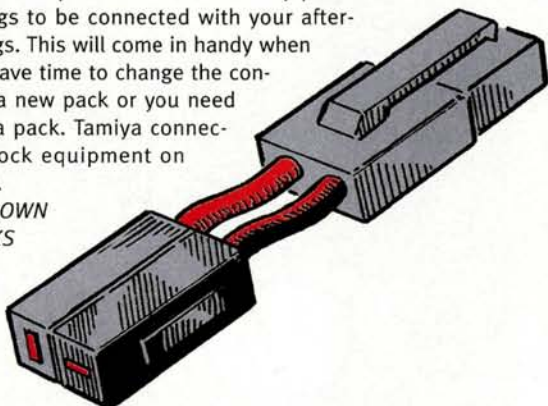
Pick up a 99¢ knitting gauge from a sewing shop. This inexpensive caliper will allow accurate comparisons of shock settings. Some racers have filed off the metal tab (a) and epoxied a new metal tab (b) to the back of the slider; this makes the caliper even easier to use and more accurate, as this mod allows the tips to fit between the shock collars.

KARL PFAMATTER
Tuscaloosa, AL

Adaptability

Construct an adapter that allows battery packs with Tamiya plugs to be connected with your after-market plugs. This will come in handy when you don't have time to change the connectors of a new pack or you need to borrow a pack. Tamiya connectors are stock equipment on most packs.

PATRICK BROWN
Lawrence, KS



Divided

Custom-divide your own wood, plastic, or card parts box to suit your needs. The dividers are thick card strips slotted halfway, as shown. The bent tabs at the ends allow the dividers to be glued to the sides of your box, or hot glue blobs may be used in the corner joints.

DANNY OLIVEIRA
Brampton, Ontario, Canada

If you have a technical problem that your hobby shop or racing friends can't resolve, give us a shout at *Radio Control Car Action*, and we'll see if we can chase down an answer for you. Questions should be of a technical nature and should be addressed to *Troubleshooting, Radio Control Car Action*, 100 East Ridge, Ridgefield, CT 06877-4606. We regret that, owing to the tremendous number of letters we receive, we can't respond to every one.

Twist 'n' Tweak

I have an Associated RC10L20 that I race at a local carpet track. It has a lot of great stuff on it, like a Novak Cyclone ESC; I also use an Airtronics Caliber 3PS radio. I've asked many people to help me with my problem, but no one seems able to come up with an answer. When I go into the turns, my left front tire rises off the ground, and then the car rolls over and goes right into the wall! I tried using an electronic scale to measure my tweak, but no matter how much weight I put on my left front tire, it would always roll over. Then I tried changing my front springs; I purchased Woods racing springs and put the stiffest on my right front and the softest on my left front. My rollover problem decreased, and the next time I went to the track, it was gone altogether. Then I got into the A-main, and all of a sudden, the rollover problem was back. I lost that race because of a broken battery strap, and I continue to lose races and damage parts due to this problem. Can you give me any help?

NICK SZALAIN

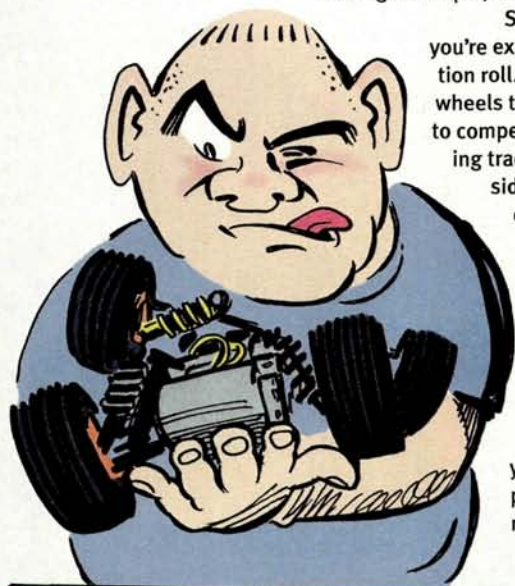
Indianapolis, IN

Boy, Nick, does this sound familiar! I used to do a whole bunch of carpet oval racing, and I had exactly the same problems as you describe. Forget the weight on the corner thing; you can get your car handling pretty well without any fancy scales or electronic doodads.

With the chassis fully loaded (batteries, motor, etc.), and the tires the same size on both sides (no stagger), place the chassis on a flat surface (such as a glass countertop in the hobby shop) and push down a few times on the top of the damper post to settle the chassis. Lift the front of the car in the center of the bumper with the edge of a flat-head screwdriver, and watch to see which front wheel lifts first. On an oval car like the RC10L20, the outside (or right side) tire should always lift before the inside wheel. If the inside tire lifts first, or if both wheels come up at the same time, carefully adjust the tweak screws according to Associated's tuning instructions included with the assembly manual. Correctly adjusted, there will be more pressure (not to be confused with weight) on the left front and right rear tires than on the wheels in the opposing corners, and it's being applied by the T-bar. This should result in a car that wants to turn rather than go straight. Simple, no?

Stay with me now What you're experiencing is called a traction roll. You have to turn your wheels too much to initiate a turn; to compensate, you may be applying traction compound to the outside tire or running a tire compound that's too soft.

Do the tweak thing, put a harder compound tire on the right front (do *not* put traction compound on this corner!), make sure that the ride height is even between the front and the rear, and you should be in the ballpark. From there, make minor tweak adjustments (an $\frac{1}{8}$ turn per tweak screw) until you're happy with the cornering speed and aren't flipping over.



Radio Daze

I bought my Traxxas Rustler ready to run with the factory radio. I really love it, and I've been driving it a lot for about a year. Would I feel a difference driving with a more sophisticated radio?

RYAN GISH

Orange, CA

Ryan, Traxxas puts a pretty good radio into the box with its ready-to-run models. With a strong AM signal, servo-reversing, solid servos and a nice receiver, it's a perfectly good entry-level system. What you do with your truck is important in determining if it would be worth the money to upgrade to a more sophisticated radio system.

If you plan to race and some fine adjustments would be beneficial to your effort, then it might make sense to upgrade to one of the more sophisticated systems. You don't want to spend twice as much money on a radio system as you did on your truck, but there are some reasonably priced, mid-level systems that include features beneficial for racing (servo endpoint adjustments, exponential, dual rate, etc.). I think the best money you can spend right now is on a new, faster steering servo. It would improve steering response and, thus, the handling of your truck, without breaking the bank!



My Rear End is too Low

I have a Tamiya Super Hornet, and I have a problem I can't figure out: the back end sits lower than the front. I don't know what the problem is. Do I have to get new shocks, or different oil, or should I just check the clips? Please help me; I'm desperate—and low on funds, since I'm only 12 years old!

MIKE ELMORE

Largo, FL

Wow, a Super Hornet! Mike, many of today's top racers cut their teeth on those kits! In fact, I'm pretty sure that I've

still got one of those hiding somewhere in the secret underground laboratory. One downside to those designs, however, is that they have few suspension adjustments to compensate for different track surfaces or component wear. By

the way, there's nothing wrong with the rear end being a little lower than the front, since that should result in more traction than steering. An extreme ride-height difference, however, could lead to bottoming over jumps and damage to the tranny case. Ouch!

I would suggest that you start by taking the rear shocks and springs off your car. Does the rest of the rear suspension still operate freely without any binding in the arms? How about the shocks themselves? The shafts should slide into and out of the shock body with only a moderate amount of resistance. They shouldn't be too stiff, and they should be the same length when fully extended. Finally, compare the length of the springs with the illustration in the assembly manual. Assuming you haven't mixed up the front and rear shock springs (check carefully; I've done this!), you may have simply worn out the springs. If they're noticeably shorter than they used to be, I would replace them with new Tamiya springs.

Too Heavy?

Recently, I got a set of DuraTrax rear competition shocks for my MRC MT10S truck, but I think my truck is too heavy for them. They were working fine until one day when I landed hard off a jump. The clip that holds the O-rings in place on the bottom of the shock body came out of one of the shocks, then the O-rings and plastic plates followed. Amazingly, I managed to find the clip. I refilled the shock with Trinity 35WT oil, but the clip popped off immediately when I raced the truck again. How do I go about fixing this?

Thanks for the help!

CHRIS DEMARTINI

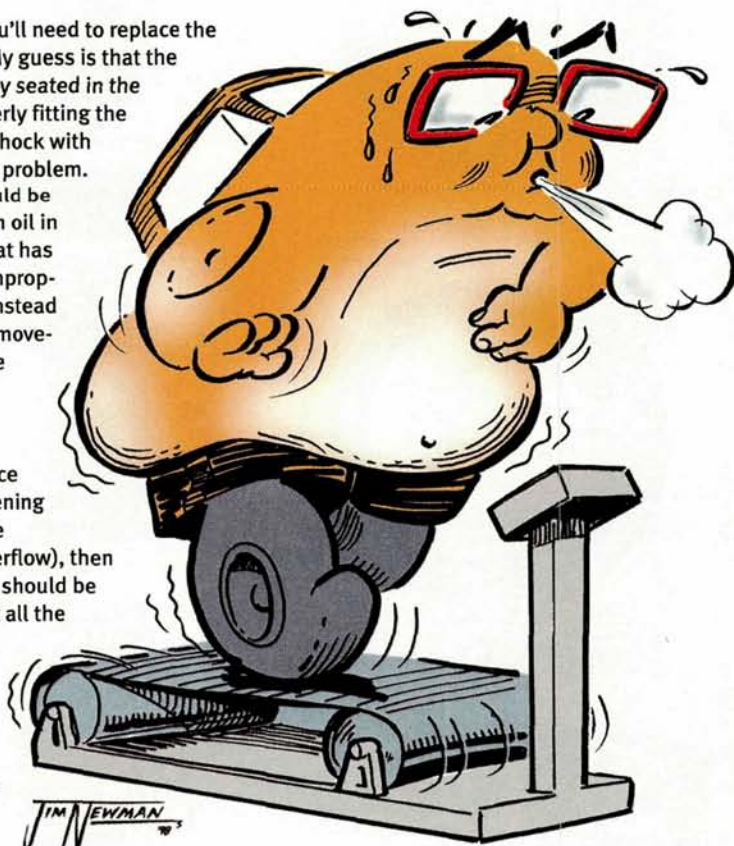
Dumont, NJ

Chris, my experience with DuraTrax shocks has always been pretty good, and I think that they're a good choice for your truck. They're durable, adjustable and provide performance that's superior to the shocks that came out of the box. But jumping any truck places heavy demands on every suspension component—shocks included.

Your truck isn't any heavier than comparable machines, but you can make things easier on your shocks by ensuring that they are assembled correctly. I would begin by finding a new clip that's similar to the one that came out of your shock (many brands of shock use similar retaining hardware). Also, check to see if the groove into which the clip fits has been

damaged. If it has, you'll need to replace the shock body as well. My guess is that the clip simply wasn't fully seated in the groove and that properly fitting the clip and refilling the shock with fluid will resolve your problem.

Another guess would be that you had too much oil in the shock. A shock that has been overfilled and improperly bled will "lock" instead of providing damped movement, and it can cause exactly the kinds of problems you've described. Refill the shocks to the rim, place the bladder in the opening (hold a rag around the shock to catch the overflow), then screw the cap on. You should be able to push the shaft all the way in, and it will slide back out about halfway. If you can't fully collapse the shock or the shaft shoots back out, you've got too much oil in there. ■



Detailing HPI's RS4 MT

Create a real "head turner" yourself!

In addition to many trick technical features, HPI's* RS4 MT also makes an excellent canvas for the R/C artisan. With its hot-looking Ford truck shell and innovative interior/chassis shield setup, there are plenty of painting and detailing opportunities for the thoughtful modeler. On the way to a cool, custom paint job for this innovative 4 x 4, I'll show you the basics of polycarbonate painting. You'll find information on sequences and how to spark the sparkle in those metal-flake colors, and I'll throw in some concours-winning ideas that will have those contest judges squinting to catch every detail. So clear off your workbench; we're going to do up this truck inside and out!

NOT FADE AWAY

Here's how to get a smoooooth fade job without an airbrush! I used Pactra's* Daytona yellow (no. RC257) and fluorescent orange (no. RC278) to create the fade effect on this body. Once you've unmasked the area for the fade, hold a small piece of cardboard over the area where the darker color will go. The cardboard blocks most of the paint but allows some of the mist to "drift," so there's no "hard" paint line. I applied the Daytona yellow first, as this is lighter than the fluorescent orange. The yellow allows the orange to "bleed" through, creating a smooth transition.

When I finished the yellow section, I held the cardboard over it and sprayed on the fluorescent orange (allow extra drying time for fluorescent colors—overnight, if possible). Each section got three or four coats, followed by two or three backing coats of fluorescent white overcoat (you can also use Sprint White—no. RC251—if the fluorescent colors have dried thoroughly). The white brightens the yellow and orange and prevents their hues from being altered by any darker colors that may be applied later.

AHEAD OF THE PACK

Together, the body and interior shell make a very attractive package, but I couldn't stop there. HPI includes a very nice styrene driver's head with the body set, but I chose to use Factory Works'* 1/10-scale driver's head, complete with air induction hose (no. PT703). It took only a short time to prep the helmet before painting.

I trimmed the leftover molding flash with a sharp hobby knife and wet-sanded with 400- and 600-grit sandpaper to smooth any remaining excess material. The Factory Works head is injection-molded of solid resin and requires paints designed for plastic (polystyrene) model cars. I painted the outside of the helmet first. Prior to painting it, I covered the inside and driver's face with masking tape. Liquid mask would also work well; just be sure to apply several thick coats so that the mask will be easy to remove. To avoid having brush streaks, I used Testor's* gloss red in a spray can. I allowed the paint to cure for 48 hours

before starting work on the driver's face. I used no. 0- and no. 00-size brushes to detail the driver's face and eyes (00 is the smallest). I also used toothpicks and straight pins for tiny detailing like the eyes. I used Poly Scale* paints on the face and parts of the inner shell. This is an acrylic-based paint and, unlike the enamel-based paints, it cleans up with water. This is an advantage when



I applied Sprint White with a brush to the driver's suit on the outside of the shell. This dries to a flat finish and gives a realistic look. I used Poly Scale Night Black acrylic paint on the steering wheel and driver's seatbelt. I used some of the decals on the included sheet and did some creative trimming to complete the interior shell. Stippling with a Parma detailing pen gives a little more character to the driver's suit.

A few simple tricks and, voilà, the result is dazzling, pro-quality paintwork, without using an airbrush.

Because metallic and "candy" colors are translucent, they require a backing color. I used Pactra's Candy Purple (no. RC273) on this project. I applied several coats of silver (gold can also be used) to bring out the sparkle in the metal-flake and add depth to those candy shades. When light colors such as yellow are applied first, spray on two to three backing coats of white. This helps avoid paint bleed-through from darker colors, and it also makes the light colors opaque. You can use this method with other light colors. For easier interior viewing and extra detail, I cut out the windows and used Pactra trim tape to construct a window net.

Left: Factory Works' realistic 1/10-scale driver's head is an injection-molded gem. The flip-up visor is included with the helmet and pivots on tiny Allen screws. I added an "air-induction hose" by slipping on some silicone insulation from a hunk of 12-gauge wire.

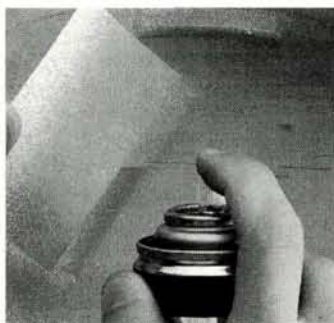
painting delicate details, as any mistakes can be easily corrected. I brushed on a peach flesh color (no. 50212) for the skin. I used white (no. 505011) for the whites of the driver's eyes and his facemask, Earth Brown (no. 505240) for the eyebrows, Night Black (no. 05214) for the inside of the helmet and Testor's blue (no. 1110) for the colored part of the eyes.

FINISH LINE

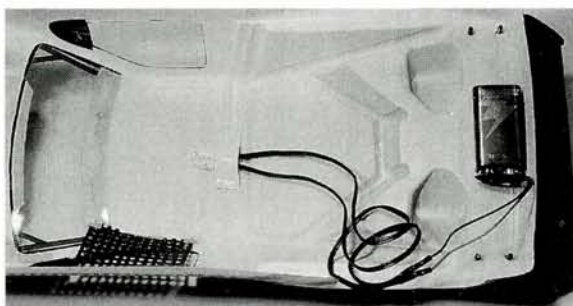
With the project completed, it was time to sit back and admire my latest labor of Lexan. Remember, it's those little details that catch the judge's eye and help bring home those concours wins and admiring looks. Until next time

*Addresses are listed alphabetically in the Index of Manufacturers on page 209.

Hold a piece of cardboard or stiff paper over the area where the darkest color in the fade will be applied. If you hold the card tightly against the shell, you'll get a hard line; leave a gap between the card and the body so some of the paint mist will "drift" under the card to create the fade effect.



HPI's meticulously detailed decal sheets have everything you need to create that true off-roader look. HPI also includes a separate sheet of stickers to decorate the inner shell. A masking tip: lay tracing paper over the window trim pieces and copy the outline to make a window-mask template.



To help shed some light on the subject, I installed small RAM headlights (no. RAM13) on the roof over the driver's head. The 9V battery is inside the rear of the truck body.

Here are a couple of tips to make painting the helmet easier. Punch a small hole through a piece of



scrap cardboard and attach the head to the cardboard with the supplied screw. This will hold the helmet securely while you paint it. Immediately after painting, cover the helmet with the top of the paint can to protect it against dust.



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Ride-Height Tuning

Which way should it tilt?

Modern R/C cars and trucks are marvelous vehicles; even most entry-level kits have all sorts of tuning options: camber, caster, toe-in, gearing, shocks, springs and pistons may all be configured to suit specific conditions. But it wasn't always this way. For example, I remember my first set of adjustable turnbuckles—purchased a decade ago for the tie rods on my RC10. All of my friends marveled at the way they quickly and easily changed the toe settings for the front wheels. When silicone shock fluids were introduced, racers were pleased to discover they no longer had to change the fluid simply because the temperature had changed. But even though we didn't have all of today's neat adjustments back then, we still managed to figure out how to tune our rides. One of our methods was to change the front-to-rear ride-height relationship.

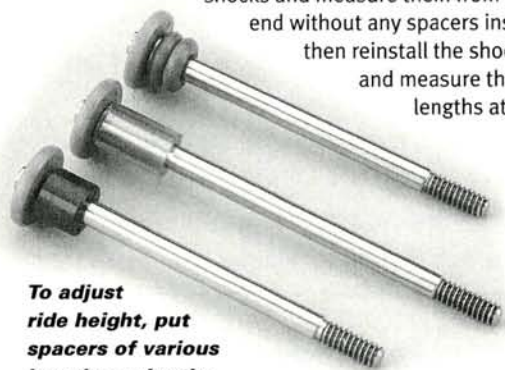
By raising or lowering the front or rear ends of our cars and trucks, we could alter their handling characteristics. Some of these changes made us go faster, while others resulted in amusing, if unfortunate, displays of R/C acrobatics. Ultimately, however, we learned a lot about how to tune our cars by changing ride height. It was fun, informative and helped us understand more about suspension than we ever thought we'd need to know.

HOW TO DO IT

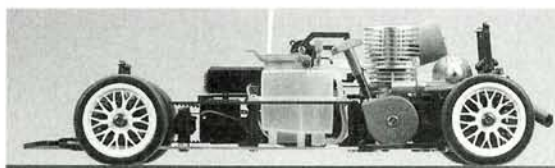
Most of today's sedans and off-road vehicles have more shock and suspension travel than they'll ever use on the average racetrack. It isn't unusual for racers to place two or three spacers under the shock piston to slam their sedans as low as they can go for high-speed cornering, and most off-road shocks are also assembled using some sort of spacer to obtain the desired travel. That said, the easiest way to alter front or rear ride height is usually to change the size or number of spacers within the shock to shorten or lengthen the exposed shaft portion. Extreme shock-length variations may require creative spring solutions or more preload clips, but these are pretty easy to figure out.

The only real limits to changing ride height are the size of the wheels you use and the ground clearance you need to clear the racing surface. Take bumps, jumps, manhole covers and other obstacles into account, and the rest comes down to pen, paper and a ruler. Remove the

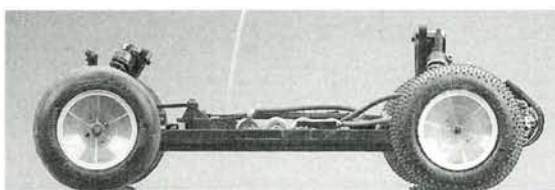
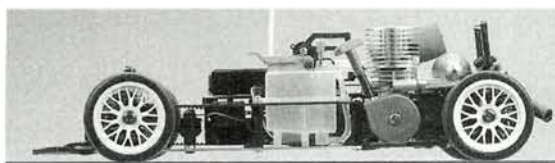
shocks and measure them from end to end without any spacers installed, then reinstall the shocks and measure their lengths at maxi-



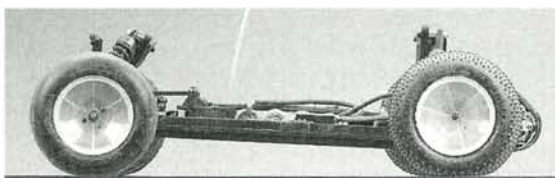
To adjust ride height, put spacers of various lengths under the shock pistons.



A sedan works well when its chassis is level (above), or when its front end is just a little lower to increase steering (below).



Trucks and buggies seem to handle and jump well with their chassis level (above) or with their fronts a little higher than their rears (below).



mum compression (chassis pressed to the workbench) and maximum extension (chassis lifted as high as it will go without the wheels leaving the ground). The difference between these two extremes is the spacer distance you have to play with.

What are the best things to use as adjustment spacers under the piston? You need something that's large enough to fit over the shock shaft, yet not so large that it will block the holes in the shock piston. While some people like to use rubber O-rings or fuel tubing, I prefer the nylon spacers made by RPM* and Associated*. They come in sets of four in assorted lengths (so I don't have to worry about cutting them down), and they won't collapse when used with a heavy spring with lots of preload. In addition to the spacers, I use thin nylon washers and rubber O-rings for fine-tuning.

Some sedans come with setscrews designed to adjust the "droop" in the suspension arms. This works well for minor ride-height adjustments, but I hesitate to use them for major ones; you may find that the screws dig into the chassis, and that can throw off the settings and damage the chassis.

You can also alter ride height through spring preload, especially if the shock is substantially longer than the spring. Many racers think that increasing spring preload is the same as installing heavier springs, but this isn't the case. You can add or remove thin preload clips, or move adjustable shock collars along the shock body to change the ride height without fundamentally altering the shock's performance.

DOWN IN FRONT!

What happens when the front end of the chassis is lower than the rear? In an off-road vehicle, what happens can be pretty ugly. The car will often bound from side to side under power (especially if equipped with a gear differential) because of the higher center of gravity in the heaviest section of the car's chassis. It will react too easily to steering input, will be twitchy down the straight sections and will endo over jumps and bumps.

Most on-road chassis, however, react nicely to a slightly lower front end. They'll usually steer a little better, especially on high-bite tracks, and you may find it easier to drift a 4WD car through fast sweepers when it's set up this way. When the front end is a little lower, you can also use a heavier front spring and shock fluid to resist body roll. This is all good stuff!

Pan cars and their F1 brethren also react well to slightly lower front ends, especially on carpet, on which traction is abundant. The lower front end reduces kingpin angle, and this smaller caster setting should make the car a little faster through the turns. Be aware, however, that too much of a difference between the front and rear ends will result in handling characteristics like those of the off-road car we talked about earlier. When someone comes to me with a carpet car that's swapping ends too easily, the first thing I check is the difference between the front and rear ride heights.

NEED A LIFT?

When the front end on an off-road car or truck is higher than the rear, things settle down very nicely. Most drivers like a little bit of push (understeer) in their off-road vehicles, and this is the easiest way to get it. The lowered center of gravity in the rear reduces body roll in the turns, stabilizes the chassis on the straight sections and slows steering response. It's no surprise that most manufacturers of these types of cars and trucks recommend that the driver set

ride height so that the rear arms are at or slightly below "dogbone level," while the front end should be at or above "arm level." Some sedan cars react well to having a slightly lower rear end, especially on slippery concrete or asphalt on which traction is at a premium. With my Roadrunner Express, I reduced my lap times by almost a full second simply by dropping the rear by 1mm!

T-bar cars rarely react well to this kind of ride-height change; they'll often spin out under

power or in tight turns, especially on parking lots. I've seen more than one racer scratching his head after two or three heats of racing, wondering why his formerly stable street-spec or F1 car has become so impossible to squirt through the S-turns without loss of traction. Invariably, a ride-height check reveals that the rear tires have worn during the previous races and the rear end is now sitting lower than the front.

ON THE LEVEL

Finally, you should experiment: run identical front and rear ride-height settings (but always as low as the track surface allows) on a variety of surfaces. On a moderate-grip surface, this typically results in a car with neutral handling that reacts predictably to steering input (assuming no problems with the suspension system and reasonable spring choices). If I race my sedan on a new parking-lot track, I begin with a "flat" setup and alter ride height at one end or the other as the surface demands. Four-wheel-drive touring cars with swaybars almost always work best at a level setting.

Off-road trucks and 4WD cars usually work pretty well with the chassis level, unless the track is particularly dusty or your tire selection is off a little. I almost always run my Team Losi truck level, and unless the jumps are particularly nasty or there's a lot of loose dirt on top of a hard lower surface, it stays that way all day. Although buggies generally like a lower back end, the larger truck tires seem to respond more favorably when set level.

HOW TO MEASURE

You know, I struggled for years to figure out the best way to measure ride heights. I used calipers, rulers and fancy jig setups to obtain the information I needed. Finally, after much frustration (is that 4mm or 5mm on the scale?), I settled on a series of Lexan strips cut precisely to several sizes, and I carry them around in my toolbox. I simply cut a sheet of clear Lexan (aluminum or stiff cardboard would work as well) into strips, each one a millimeter wider than the last, until I had a small pile of thickness gauges. I wrote the width on each strip and wrapped a rubber band around the stack. Now, when I want to find out how high a chassis is off the ground, I whip out my ride-height strips and insert one at a time until I find one that just barely goes under the chassis. This puts me within a millimeter of the exact ride height, and I don't have to squint at the ruler or guess any longer! Schumacher* now offers a one-piece ride-height gauge that works in a similar way. Buy one, or make your own; either way, your bench life will be easier.

Take a few moments to measure your vehicle's front and rear ride heights, and play with these settings when you next tune your car. You'll learn a lot about how suspension works, and you just might discover a little tuning secret that will keep you ahead of the pack!

*Addresses are listed alphabetically in the Index of Manufacturers on page 209. ■

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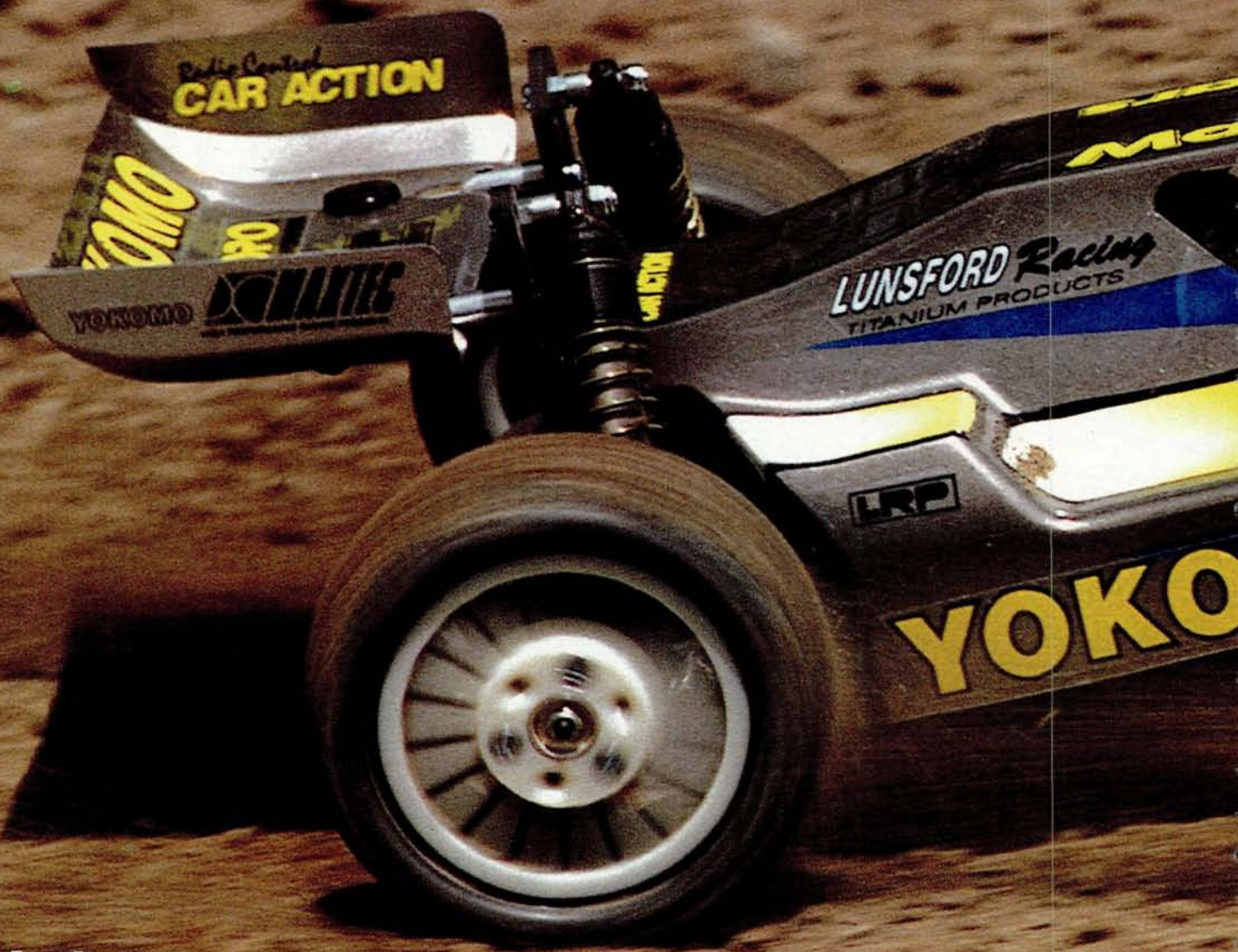
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The Super Dog Fighter is back. Four-wheelin' fanatics everywhere should remember Yokomo's venerable Dog Fighter cars; this series chalked up several major wins, thanks to its then cutting-edge, high-performance designs. Yokomo also threw in the YZ-10 Worlds car, a replica of Mark Pavidis's IFMAR world-champion buggy, which I had the pleasure of testing back in 1996. Yokomo won another world championship in 1997 with a new Super Dog Fighter prototype: the MX-4. More recently, Barry Baker took the Florida Winterchamps with an MX-4. Since I'm the one who reviewed the last world champ Yoke, it only made sense for me to test the latest, too; at least, that's what I told the G-Man ... and he bought it!*



Yokomo **MX-4 4WD Buggy**

by Greg Vogel

FROM PROTOTYPE—



KIT FEATURES

Yokomo's impressive kit quality starts with the packaging. When you open the kit, you will find the usual numbered bags, but within each one the parts are grouped in smaller bags to correspond with each step. Of all the kits I've built (hundreds!), the Yoke was the most organized build I've experienced.

• Chassis. Yokomo still uses the finest materials. The 3mm carbon-

fiber chassis showed no fraying and is finished with a high-gloss shine. However, some experience is needed to build the kit, and the chassis is a prime example. The battery slots must be filed to prevent the batteries' shrink-wrap from being cut by sharp edges, and you must grind a recess into the nose of the chassis to allow belt clearance. An addendum sheet was with the manual; it indicated where material must be removed in the rear of the chassis to

prevent the suspension from binding.

Precision-machined aluminum posts support the upper deck and battery hold-downs. The batteries are held by slotted fiberglass plates that accept a variety of battery configurations—even stick packs. The upper deck has several fiberglass pieces. The MX-4 uses a stiff spring "shock" with an adjustable collar to absorb the energy of an impact and allow a bit of chassis flex.

TO PRODUCTION!

YOKOMO MX-4



s p e c s

SCALE 1/10
LIST PRICE \$499.99

DIMENSIONS
Length overall 15.47 in.
Wheelbase 10.79 in.
Width (F/R) 9.56/9.62 in.

WEIGHT
Gross, (RTR) 3 lb., 11.5 oz.

CHASSIS
Type Plate
Material Graphite lower deck and
multipiece fiberglass
upper deck w/shock

DRIVE TRAIN
Type Belt
Primary Pinion/spur
Transmission CVDs
Differential(s) Ball
Slipper clutch Pad type
Bearings/bushings Bearings

SUSPENSION (F/R)
Type Lower A-arm
w/adjustable upper link
Damping Oil-filled, coil-over
shocks

WHEELS
Type One-piece nylon spoke
Dimensions (DxW) (F) 2.2x1/(R) 2.2x1.3 in.

Tires Mini-pin spike tire

ELECTRICS
Motor 10x2 Maxtec
ShockWave**
Battery Maxtec V-Tech
2000mAh**
ESC LRP V6**

**Not included

• **Suspension.** The MX-4 uses all-new suspension components. The nose plate/suspension pivot block gives the car kick-up and a rugged base for the suspension arms. The arms are molded of a rigid composite material and include several holes for optional shock positions. Up front,

the adjustable upper tie rods are attached to the stout hub carriers. The hub carriers keep the included MIP CVDs well shielded from dirt, and the walls of the pieces are plenty thick—thumbs up for Yokomo; I can't tell you how often I've seen these carriers break on older cars. The steering knuckles are also chunky pieces, and the threaded kingpins ride on metal sleeves to prevent wear on the hub carriers. The rear hub carriers have three optional, lower pivot-mounting locations for tuning. The top hole is for bumpy tracks; the lower holes are for smoother surfaces.

The MX-4's unique shock towers are attached to the upper composite bulkhead caps. The front, "Y"-shaped tower uses three aluminum standoffs to support the fiberglass camber mount. The rear shock tower offers as many camber and shock locations as the front.

• **Drive train.** The MX-4's new belt drive is extremely innovative. To increase the stability of the car, the differentials have been narrowed as much as possible to keep the drive-train parts centered. The rear diff is dead center in the bulkhead and uses a wide, coarse-tooth pulley and belt to minimize the chances of skipping. Two alu-

minum pulleys drive the rear and front belts. The front pulley incorporates a one-way bearing, and this gives the car better straight-away speeds. The spur gear is recessed to house the slipper clutch and keep everything tight. The slipper is adjusted by a large, knurled nut that doubles as a thrust washer; the unit contains 24 hard steel balls and is covered with a plate before it is assembled with a large spring washer to maintain tension on the slipper.

The entire drive train rides on smooth ball bearings with efficient MIP* CVDs driving the wheels. New, large hex hubs are bolted onto the CVDs, and each wheel is attached by three flat-head screws.

• **Body and tires.** The MX-4 comes with mini-pin racing tires with foam liners and cool multi-spoke rims. The low-profile body has a boxy shape that won't be mistaken for anything else on the track, and a Lexan undertray keeps out dirt. The two are attached by strips of Velcro®-brand fastener.

TEST GEAR

I pulled out some suitably high-performance electronics for the MX-4. A KO Propo* Mars transmitter and receiver combination handled my commands and was matched to a KO FET-boosted 2000 servo for ultra-quick, high-torque steering response. A Maxtec* ShockWave motor and matched V-Tech 2000mAh battery supplied the car with plenty of power, as regulated by an LRP* V6 speedo. This gear was good enough for Barry Baker's A-main win at the Florida Winterchamps, so it's good enough for me.

YOU'LL NEED

- 2-channel radio (preferably with a competition servo and micro receiver).
- ESC.
- Battery.
- Motor.
- Charger.
- Paint.
- Tools for assembly (file, screwdriver, pliers, etc.).
- CA glue for tires.

FACTORY OPTIONS

- Graphite—upper deck and link plate (F/R)—part no. ZM-117G.
- battery plate (L/R)—ZM-118GL/ZM-118GR.
- shock tower (F/R)—ZM-712G/ZM-722G.
- front bulkhead support—ZM-301G.
- front upper l-arm support—ZM-302G.
- Lightweight motor plate—ZM-304S.
- Suspension-arm pin set—ZM-408S.
- MIP aluminum CVD (F/R)—ZM-425A/ZM-422A.
- Lightweight servo-saver mount—ZM-200L.
- Servo-saver bearing—BB-84-4.

BUILDING & SETUP TIPS

The MX-4's illustrated instruction manual and addendum sheet are very helpful in building the kit, but some previous R/C building experience will be beneficial. Here are a few helpful hints:

■ Lightly sand the sharp edges of the graphite and fiberglass parts.

■ Chamfer the battery slots and retaining plates with a file so the batteries fit snugly between them.

■ Use RCPS* Green Slime on the shocks' O-rings to help them

work more smoothly and provide a better seal.

■ Use Loctite* on the screws for the motor mount, the steering bellcrank posts and also on each of the wheels' screws to help prevent them from vibrating loose.

■ Clean the chassis where the servo will be

mounted with some motor spray. This will help the servo tape adhere better.

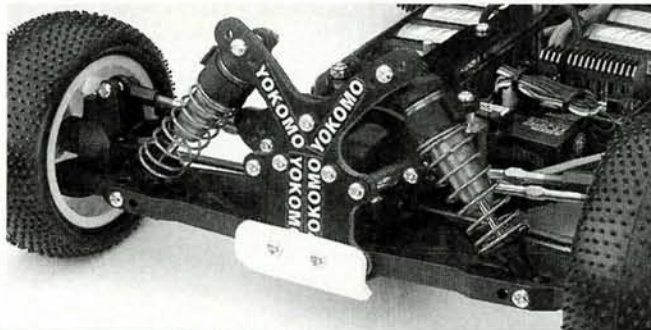
■ Experiment with placement of the batteries. When I used the 4x2 layout, I found I could easily adjust the chassis' jumping attitude by moving the two cells fore and aft on the right side of the car.

PERFORMANCE

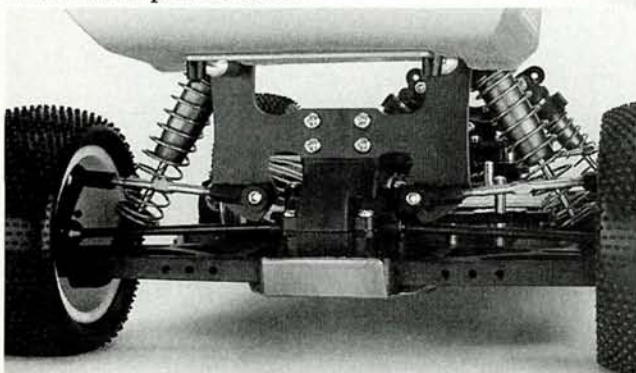
Competition vehicles get competition-tested here at *R/C Car Action*, so I headed to the Northeast State Championships and entered the MX-4 in the stock event. I slipped the handout stock motor into the car and tried to put on a 22-tooth pinion gear that would allow me to finish the 5-minute races. I say "tried to," because the small holes in the motor plate were evidently for modified motors only; they didn't allow the larger gear to mesh properly. After slightly elongating the mounting holes, I managed to get a little play in the gears. Next, I changed all my packs to the preferred 4x2 configuration and rebent the solder tabs to go out and over the battery hold-down plates. Some

kick out the rear end of the car and sling-shot out of the turn with authority. Impressive stuff, but the loads imposed on the servo by such aggressive driving caused its mounting tape to loosen. I reattached the servo with new tape and added a bead of Zap* Goo around it for extra security.

The MX-4 jumps more smoothly than older Yokomo buggies. The classic Yokomo rear chassis "slap" when launching off a jump has been almost totally eradicated. The car landed well off the large jumps and touched down with a slight nose-down atti-



Above: the fiberglass shock tower offers several mounting positions for the shocks. Notice the knuckle carrier; the large scoop in the front helps deflect dirt from the CVDs and increases the parts' strength. Left: the narrow rear bulkhead houses the rear ball diff with a wide belt and pulley. The stock tie rods were replaced with Lunsford units.



racers file the slots to allow the battery bar to slide up and through, while others solder the wires directly to the battery. Once those minor setup details had been sorted out, it was time to hit the track.

For a stock-out-of-the-box car (with the exception of Lunsford* titanium tie rods), this car was dialed. With a stock motor, the car's acceleration and straightaway speed were a lot quicker than other 4-wheel cars on the track. Since we were all running handouts, this was a good testimonial to the car's efficiency.

The MX-4's steering is very responsive when exiting the turns. The car exhibits a bit of push (understeer) when entering a turn on power but is easily "tightened up" by backing off on the gas. At the midpoint of a turn, I could get back on the throttle,



Above: the front camber plate is supported by posts off the front shock tower; this keeps the rods dead center above the arm to reduce geometrical change during movement. Right: the rear spur gear is offset to house the slipper clutch. The clutch is adjusted by the large knurled knob. The adjustments are finicky because only one large spring washer applies the tension.

- High-quality parts.
- Handles great on both flat and bumpy tracks.
- Many suspension-tuning options.
- Supplement sheet gives valuable setup information.
- Accepts stick packs (for you casual types).
- MIP CVDs included.

dislikes

- No precut slots on the battery hold-down plate to accommodate the pack's solder tabs.
- Motor plate needs to be filed to fit larger gears when running stock.
- Minimal room for electrics.

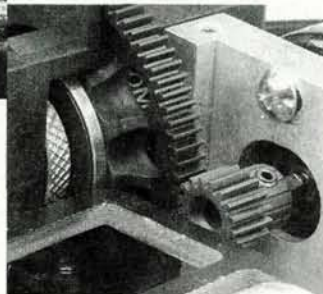
tude. This jumping posture allowed me to quickly duck into the turns following the jumps.

When the race day was over (fourth in the A), I slipped in the previously mentioned Maxtec 10 double motor to see how the MX-4 would handle with a mod. Again, the buggy quickly shot off the line, but this time, it was accompanied by the whine of the slipper clutch. As one might expect, the slipper definitely needs to be set tighter when using a mod, but be sure to leave enough slip to protect the drive train. Properly set, the slipper will prevent the belt from slipping, improve the car's handling over bumps and extend the time between diff rebuilds.

With the increase in power, the stock tires didn't hook up as well as I would have liked, so I slipped on some Losi* IFMAR pin tires for better hook-up on the loamy surface. The MX-4 becomes more responsive to throttle commands with a faster motor. Blips of throttle in the air can change the car's attitude off jumps; turns remained the same, with a slight push in the entry, but the car exhibited fast exiting abilities. I will have to continue playing with the shocks' down-travel to see whether I can enhance the car's cornering ability.

FINAL THOUGHTS

The new Yokomo MX-4's handling is far superior to that of any of its predecessors, and the durability of



the buggy and its parts is topnotch. I drilled the car into a stationary barrier at full speed (accidentally; what did you think?) and drove away with only a bent bumper. The car's drivability was excellent in pure stock form, and its numerous tuning options should make it easy to dial in for almost any surface. If this car could win the Worlds and the Florida Winterchamps in prototype form, just imagine what the refined production model could do at your hometown racetrack!

* Addresses are listed alphabetically in the Index of Manufacturers on page 209.

THE COMPETITION

	Schumacher CAT 98	Tenth Technology PREDATOR TEAM CAR	Team Losi XX-4	Yokomo MX-4
Wheelbase	11 in.	11.19 in.	10.7 in.	10.79 in.
Width (F/R)	9.5 in.	9.75 in.	9.7/9.8 in.	9 9/16/9 5/8 in.
Weight	3 lb., 6 oz.	3 lb., 12 oz.	3 lb., 10.3 oz.	3 lb., 11.75 oz.
Diff type	Ball	Ball	Ball	Ball
Chassis	Fiberglass	Nylon composite	Graphite composite	Graphite
List price	\$529.50	\$670	\$499.95	\$499.99
Available at*	\$329.95	\$450	\$289.99	NA
Reviewed in	12/95	9/96	8/97	9/98

*Prices vary with location.



Associated Nitro Dual Sport

by Brian Leslie

THE APPEAL of touring cars is undeniable, but the ubiquitous 4WD sedans aren't the only way to hit the pavement. For fans of the 2WD driving experience, Associated's* Dual Sport has proven to be a fast, highly tunable and exciting way to take R/C action to the street. It doesn't hurt that the DS is a wide machine with fat street tires and trick, hot-roddish wheels, either; if your tastes tend toward muscle machines, a Dual Sport is a great platform to build on. But for real muscle, you just gotta have nitro power. The sound and smell of a nitro powerplant—and yeah, the speed—make the Nitro Dual Sport a natural for this gas guy. I'll cut to the chase and say this car is a blast! Let me show you what the Nitro DS is made of and what it can do

SCALE 1/10
LIST PRICE \$410

DIMENSIONS
Length overall 15.875 in.
Wheelbase 10.1875 in.
Width (F/R) 8/8.25 in.

WEIGHT
Gross, RTR 3 lb., 9.28 oz.

CHASSIS
Type Tub
Material Aluminum

DRIVE TRAIN
Type Sealed gearbox
(2.60:1 reduction)
Primary Pinion/spur gear
Transmission Universal-joint
drive shafts
Differential(s) Ball
Clutch Centrifugal
Bearings/bushings Bearings

SUSPENSION (F/R)
Type Independent A-arm
w/upper link
Damping Oil-filled, coil-over
shocks

WHEELS (F/R)
Type Chrome-plated
2-piece plastic
Dimensions (DxW) 1.65x1.22/1.65x1.40 in.

TIRES
Type Pro-Line Speed Hawgs
G-compound



THE KIT

The DS is made for parking-lot racing, so it is fitting that the chassis accommodates five styles of bodies commonly found in on-road: Chevy Camaro Trans Am, Ford Mustang Trans Am, BMW DTM, Mercedes DTM and, my favorite, the Ford F150 Super Truck commonly found on the Craftsman

series NASTRUCK racing tour.

The DS kit comes in two forms: Sport and Racer. The Sport kit comes with any one of the five bodies mentioned above and the hardware to accept a pull-start engine, including the header pipe and muffler. The Racer doesn't come with a body but includes ball bearings, Teflon-coated shocks,

universal swing shafts and a tuned pipe, and the Racer is available with pull-start or non-pull-start engine. Most distributors offer both versions with a .12-size powerplant as an option. I'm a big O.S. fan, so I chose to outfit my DS with an O.S. CVS. The "S" stands for "short shaft"; it's precut to fit the chassis (as well as the RC10GT).

Haulin' gas



The Nitro Dual Sport is similar to Associated's RC10GT. The two share the same chassis and transmission, but the suspension arms, shocks and towers have been shortened to create an on-road platform.



• **Chassis.** The DS's black, aluminum-tub chassis is the same as the RC10GT's, as are the Stealth transmission, brake assembly and slipper clutch. Because I am a big fan of the GT, I was glad to see these features carried over to the DS.

The front nose plate has 8 degrees of front kick-up, which aids in high-speed, straight-line stability. A high-impact bumper adorns the front end—just in case. Aluminum nose-brace tubes reinforce the front-end assembly.

A one-piece drag link connects the two steering bellcranks. A spring-loaded adjustable servo-saver protects the steering servo. Farther back, a center-mounted 75cc fuel tank takes up most of the space in the chassis along with the powerplant. Six screws and a molded tranny brace help prevent all of the O.S.'s horsepower from twisting out of the chassis.

• **Drive train.** The famous, bulletproof Stealth transmission delivers power to the universal swingshafts. The GT's 2.60:1 final drive ratio stays intact and is offset by a smaller spur gear and larger clutch bell to accommodate the smaller-diameter tires.

Nothing can be added to what has already been said about this drive train. Race-proven and parking-lot tested, it's simplicity and durability at its best.

• **Suspension.** This is where similarity to the GT ends. Short, composite-molded A-arms

YOU'LL NEED

- Good quality 2-channel radio system.
- High-torque servo for steering.
- Servo for throttle.
- .12-size nitro engine.
- 10- to 20-percent-nitro fuel.
- Glow-plug igniter.
- Starter, if you don't have a pull-start engine.
- Body.
- Paint.
- Decals.
- Lots of asphalt!

FACTORY OPTIONS

- Shock springs
 - Black (soft)—part no. 8232.
 - Green (medium)—6494.
- Rear hub carriers
 - 1.5-degree (requires no. 9277 ball bearing to fit DS rear axles)—6366.
 - 3-degree (when installed backwards, results in zero degrees)—7358.
- Caster blocks (25 degree; results in 3 degrees caster)—6215.
- Foam tires (F/R)—8888/8898.
- Teflon shock-piston kit—6465.
- DS hub caps (yellow/black)—8877/8878
- DS wheels (F/R, black)—8881/8891.

Factory Team Options

- DS blue titanium turnbuckle kit—1260.
 - Titanium hinge-pin set—1640.
 - Titanium turnbuckle/hinge-pin combo—1540.
 - Front arms, graphite—8811.
 - Front shock strut, graphite—8833.
 - Blue aluminum screw set—8809.
 - Rear arms, graphite—8861.
 - Rear shock strut, graphite—8871.
- Protective chassis sheet—6312.
- Blue aluminum ball ends (8)—4447.
- Nitro DS blue aluminum set—8901.
- Unobtainium shock shaft—8845.

BUILDING & SETUP TIPS

The assembly manual is typical of all Associated kits—excellent. Clear pictures accompanied by concise text make the building process easy and fun. It is very tempting to build the DS just by following the pictures, but *don't do this*. The written instructions offer many assembly tips and warn of potential trouble spots.

■ If you are new to fully suspended cars, I suggest you start your setup from scratch as I did. Remove the front and rear swaybars and adjust the ride height according to the manual. Run the car for a few laps, and make small ride-height adjustments as follows:

- If the car pushes (won't turn), increase rear ride height.
- If the car is too loose (spins out easily), increase front ride height.

Add the front swaybar, placing the linkages at the very tip of it to minimize its effect on handling, then adjust the linkage inward as needed.

When you are comfortable with the car's handling, add the swaybar and start making adjustments as you did with the front bar. Make only one small adjustment to one part of the suspension at a time. If you make many changes at once, you won't be able to tell which change produced which handling effect. By making only one adjustment at a time, you'll see how each one affects the car, and you'll be able to make this change the next time you want to produce that effect.

■ Caster can also dramatically affect handling. Caster describes the angle of the kingpin in relation to the ground. For example, with zero caster, the kingpin is vertical (viewed from the side). With positive caster, the top of the kingpin leans toward the rear of the car. Increasing positive caster will increase the steering going into a corner and decrease it coming out of that corner. It will also make the car more stable on the straights.

Negative caster is never desirable.

■ Camber is the angle of the wheels relative to the ground (viewed from the front or rear of the car) and is another valuable tuning aid. With negative camber, the tops of the wheels lean inward toward the middle of the chassis. For this kit, Associated recommends 1 to 2 degrees of negative camber at all times. Positive camber is never used.

Negative camber will reduce traction but will increase stability. A tire achieves maximum traction when the wheel is vertical. On the workbench, push the car to mimic its entering and going through a turn. Notice how the outside tire wants to roll over. You need to place enough negative camber on the wheel so that the tire stays flat on the track in the middle of the turn. This is true for the rear tires as well.

Less negative camber means more traction and less stability; more negative camber means less traction and more stability.

■ Negative toe (toe-in) increases stability under acceleration but slightly reduces turn-in speed. Positive toe (toe-out) does exactly the opposite, and both scrub off a little speed.

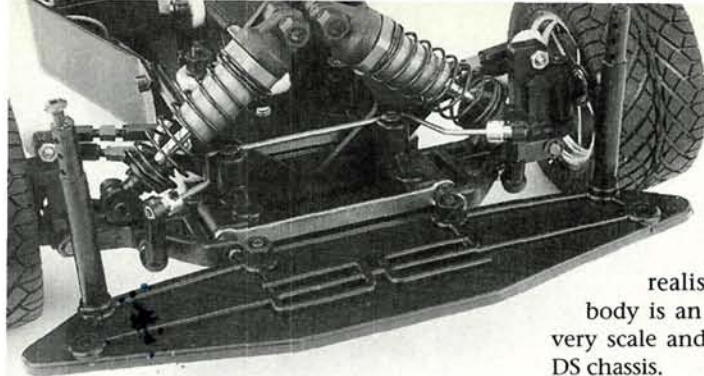
For the front wheels, the suggested starting point is zero toe.

Negative toe in the rear decreases steering but increases traction. The DS comes with 3 degrees toe-in on both rear wheels. To achieve zero toe, you need a no. 7358 hub carrier mounted backwards—left on the right and right on the left.

■ Associated suggests a front/rear chassis ride height of 0.4 inch. To adjust ride height, use preload spacers of various thicknesses on the shock bodies.

To measure ride height, set the car up ready to run with a full tank. Put it on a flat surface, and push down on it several times. Then, measure from the chassis' bottom edge to the surface, and that measurement is ride height.

When you change ride height, you also change handling characteristics. Increasing rear ride height reduces rear traction and increases steering, and vice versa. Increasing front ride height reduces steering and increases rear traction, and vice versa.



The DS is equipped with hard-anodized aluminum shocks and a swaybar for smooth handling.

ply awesome, right down to the hand-cut numbers. AutoGraphics* supplied the realistic decals. The NASTRUCK body is an excellent replica and looks very scale and very cool mounted on the DS chassis.

are at all four corners of the DS. Steel-turn-buckle tie rods and ball cups are used as upper control links and allow quick camber adjustments on race day.

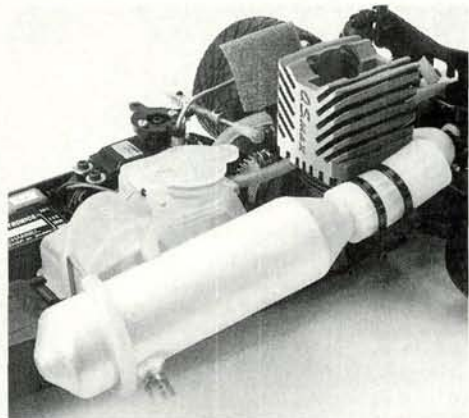
Up front, Associated's famous Teflon-coated hard-anodized shocks with silver springs and 0.56-inch body are mounted to special shock risers on the A-arms. Pure 40WT silicone oil with number-1 shock pistons and special, shorter stroke 0.35 DS shock shafts are standard issue. The tops of the shocks are mounted on a black fiberglass shock tower that places the shocks at about a 45-degree angle to meet in the center of the chassis. This shock angle makes

• **Wheels and tires.** Pro-Line* Road Hawgs G-compound tires with firm blue-foam inserts are at all four corners of the DS. Chrome rims with gold BBS-style inserts make for extremely hot-looking wheels—even if they aren't NASTRUCK style.

TEST GEAR

- Airtronics* CS2P transmitter.
- Airtronics 94151 high-speed/high-torque servo for steering and throttle.
- Sanyo* 500mAh receiver battery pack.
- Blue Thunder* 20-percent-nitro fuel.
- O.S.* no. 8 glow plug.
- McDaniel* glow igniter.

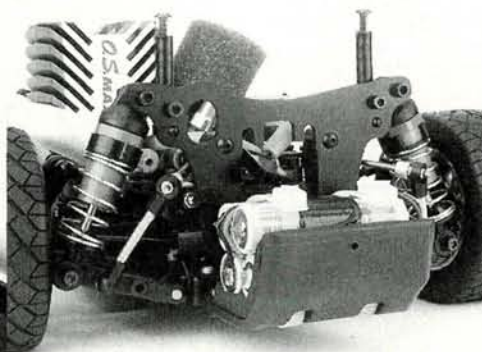
Left: the stock tuned pipe and manifold were bolted to an O.S. CV engine. A 75cc fuel tank provides long runs and is easily accessible with its flip-up lid. Below: Airtronics radio gear directs the car; the receiver is mounted on a plastic platform to protect it from the engine vibration that resonates through the chassis. Right: the battery is mounted on a skidplate in the rear and is held in with tie-straps. Pro-Line's Speed Hawg tires are stock on all four corners.



the shocks less sensitive to wheel travel and also allows the use of stiffer springs. A 0.062-inch swaybar is attached to the suspension by a very adjustable and user-friendly linkage setup. Roll-bar pre-load and leverage are adjustable.

In the rear, there's another set of short A-arms and hard-anodized shocks mounted on a black-fiberglass rear shock tower. Multiple upper control-link mounting holes in the molded rear chassis brace help the racer fine-tune for difficult conditions. A 0.078-inch swaybar is attached to the rear suspension and offers the same adjustments as the front bar. Three degrees of total toe-in per side and zero-degree hub carriers complete the rear-end package.

• **Body.** The Ford F150 Super Truck body was painted by Scot Bich of Bich'n Bodies* to look like the Craftsman series NAS-TRUCK-tour Raybestos Brakes entry. As usual, Scot's paint job and detailing are sim-



PERFORMANCE

I broke in the mini O.S. powerplant with Blue Thunder 20-percent-nitro at the richest possible setting. After four tanks of fuel, I was ready to lean the air/fuel mixture and take some serious laps.

Using corner markers, I laid out a road-course in the shape of a "U" at a local parking lot.

After about 30 minutes and two tanks of fuel, I had the truck where I wanted it—slightly loose coming out of the turns. My final setup was just as suggested in the manual, except I changed the front springs to the next softest rating, green, and I removed the rear swaybar.

There is no question that this truck

Likes

- Race-proven RC10GT platform.
- Very tunable suspension.
- World-class factory support.
- Pro-Line G-compound Speed Hawgs.
- Bulletproof Stealth transmission.
- Cool-looking wheels.

dislikes

- Difficult to install standard-size steering servo.
- Doesn't accept standard hex-mount touring-car rims.

moves, but what's most amazing is how well it handles on less than ideal asphalt. You can kick the rear end out and steer with the throttle to your heart's content and never lose control. I pushed the truck farther and farther into each turn to the point of applying the brakes pretty hard. I could actually start the rear end sliding when I entered the turn, then gas it to keep the slide going through the turn and let it drift like a 4WD car. At each fuel stop, I checked the tires for wear, made minor camber changes to adjust for wear and was surprised at how warm the little gumballs got. Of course, when you run for an hour without turning off the engine, things tend to heat up.

The DS never failed—no shock leaks, no loose screws, no broken parts; I didn't even have to adjust the brake. Simply flawless. The same goes for the O.S. CV. Perfect! Once they had been set, I never made another adjustment to the engine's needle valves or idle screw, and not once did it flame out or stall when stopped. I could have run a full gallon of fuel, had time allowed, but the sun started

to go down, so I packed it in with thoughts of when I would be able to get back out onto the pavement.

FINAL THOUGHTS

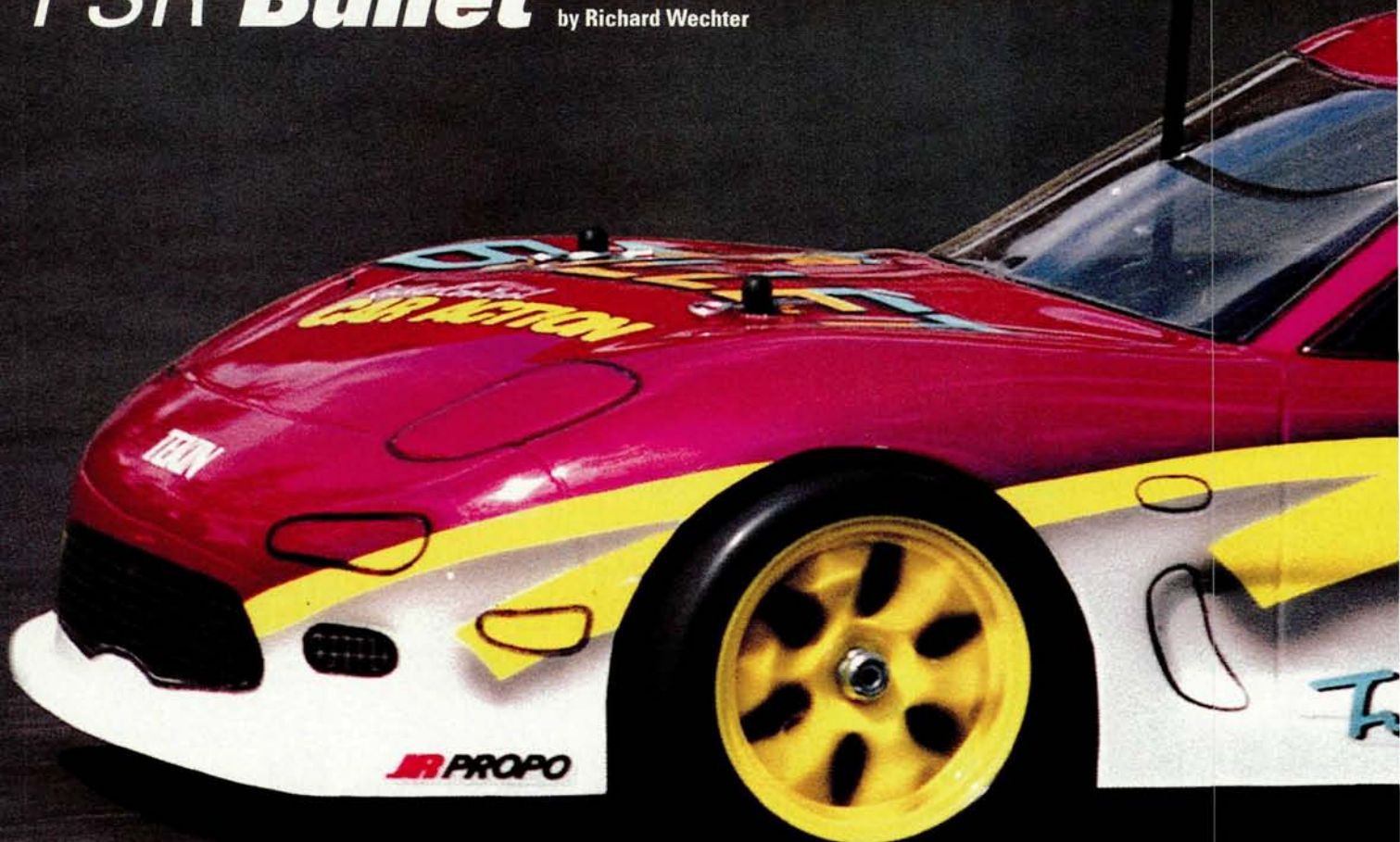
With so many tuning options, the DS can be tuned to suit any driving style. Set it up loose, tight, or neutral; it's your decision. As far as handling all that O.S. horsepower goes—no problem. The G-compound tires really dig in, no matter how poor the running surface may be. For clean pavement, the optional foam tires are the preferred choice.

No corners were cut when Associated designed this car. High-tech components combined with race-proven designs add up to big-time performance and fun.

*Addresses are listed alphabetically in the Index of Manufacturers on page 209. ■

FSR Bullet

by Richard Wechter



D ID YOU EVER notice how racing tends to homogenize vehicle design? Once a winning formula has been discovered, it is quickly adopted by almost every manufacturer who cares about winning races. This is especially true of competitive touring cars, which (with a few exceptions) have widely embraced the model of a mid-motor/dual-belt drive train, double-deck chassis and A-arm/upper-link suspension. The latest entry in the hotly contested sedan arena, however, bucks the trend. With an innovative chassis design that borrows from 1/8-scale on-road cars and employs some clearly inspired engineering, the new FSR* Bullet offers a radical design that oozes performance. But does it work? I look forward to finding out!

SCALE 1/10
LIST PRICE \$425

s p e c s

DIMENSIONS

Length overall 14.5 in.
Wheelbase 10.03 to 10.2 in.
Width (F/R) 7.2/7.5 in.

WEIGHT

Gross (RTR) 3 lb., 3 oz.

CHASSIS

Type Plate w/4-piece upper deck
Material Woven graphite

DRIVE TRAIN

Type Belt-driven 4WD
Primary Pinion/spur
Transmission Universals

Pavement projectile



Differential(s) Ball
Bearings/bushings Bearings

SUSPENSION (F/R)

Type Double wishbone
Damping Adjustable oil-filled
coil-over

WHEELS

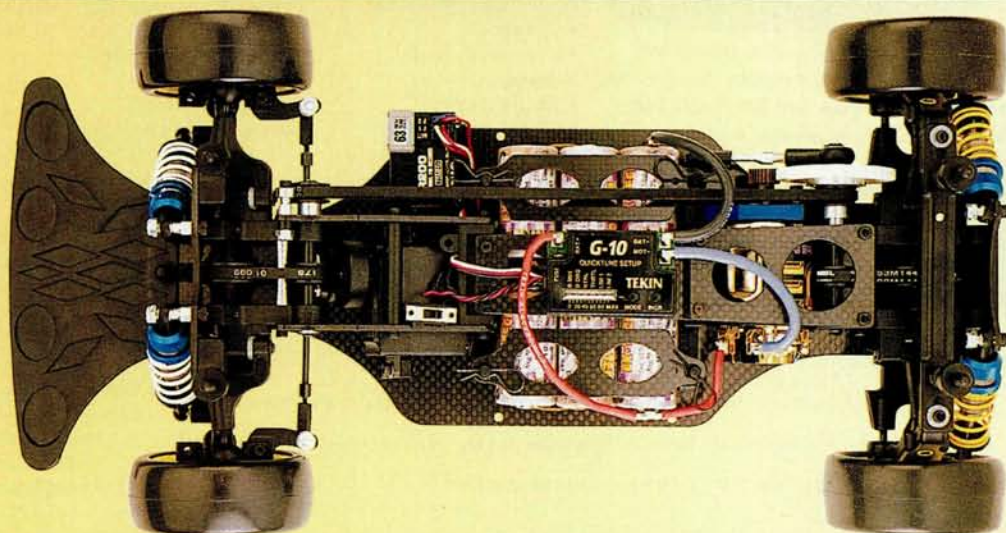
Type One-piece molded plastic
Dimensions (DxW) 2x1 in.

TIRES

Type Standard-width slick
w/foam inserts

ELECTRICS USED

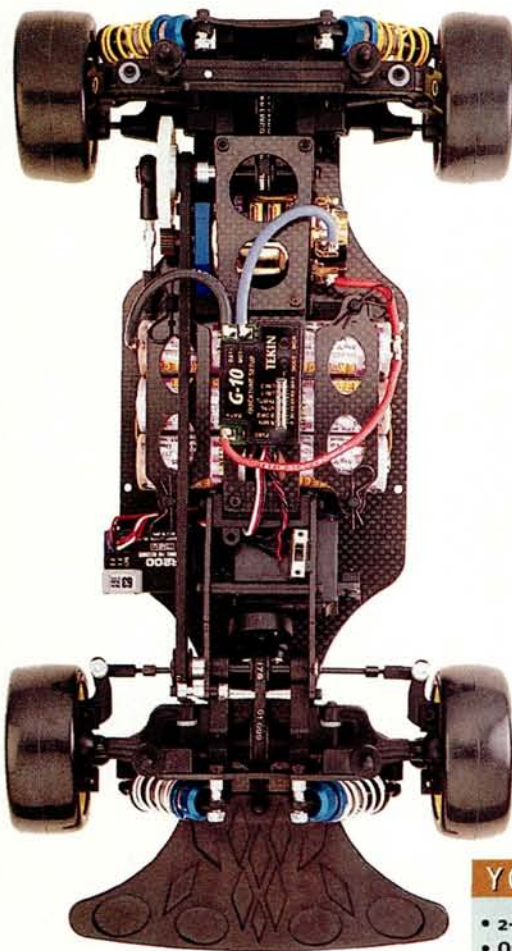
Motor Trinity D3 10 x 2
Battery Trinity VIS-2000
ESC Tekin G-10





KIT FEATURES

• **Chassis.** With just a glance at the Bullet's woven-graphite chassis plates, you know you will have yourself a serious sedan when the wrenching has been done. The slot configuration on the chassis allows a 6-cell saddle pack to be placed in the center of the car to evenly distribute the weight to all



The Bullet is fitted with a Trinity VIS matched battery, D3 motor, Tekin G-10 speedo, JR Racing and KO Propo electronics. Racing is always a pleasure with this gear.

BUILDING & SETUP TIPS

■ A bit of RCPS* Green Slime on shock O-rings prevents them from being damaged when you insert the shock shaft and will also give your shocks smoother action.

■ Sticky tires like those included with the Bullet often bear traces of mold-release-agent; this can foul the CA when you glue the tires to the rims. For the best bond, wipe the bonding surfaces with denatured alcohol before gluing.

■ When you reach page 16 in the manual, use a 4-40 x 1/4 screw, not the longer one pictured.

■ I had to scour the kit to find part HW-20. It's in a small part bag with part M-30.

■ Use Loctite* on the screws that hold the motor-mount assembly.

four corners. Two graphite plates hold the batteries in place. The graphite upper deck consists of four plates, two lying horizontally in the rear for bracing and two vertical up front to link the bulkhead to the center supports. Large holes relieve excess material from the plates to reduce weight.

• **Suspension.** Let's start up front. The Bullet's hub design has been used on 1/8-scale on-road cars for years. The car utilizes a double-wishbone suspension system and connects each pair of wishbones to the hubs with two large-diameter pivot balls in lieu of the usual hinge pins. Instead of snapping into the hubs, however, the pivot balls first go through the hub and are threaded into the suspension arms. An aluminum retainer is threaded into the hub behind each pivot ball, allowing the builder to precisely tighten each ball socket for zero slop without unwanted binding. The front track and camber are adjusted by backing out or screwing in the pivot balls. To adjust caster, nylon spacers are used to move the upper wishbones fore and aft, much like the caster adjustment of a pan-car front end.

The rear suspension uses three similar pivot balls. As with the front setup, the track and camber can be adjusted easily and precisely. The hub carriers have large tabs that extend from their tops to attach the Bullet's unique floating rear body mount. This system channels downforce directly to the hubs rather than loading the force into the suspension through chassis-mounted body posts.

The Bullet's oil-filled shocks are extremely user-friendly. The short, blue-anodized aluminum bodies are finely threaded for highly accurate preload adjustment via a knurled collar, and the damping action is as smooth as that of other high-end shocks. The dampers are mounted on plate shock towers constructed of the same woven graphite as the chassis. Paradoxically, only a single hole is provided for the upper mount of each shock; FSR

presumably spent a lot of time finding just the right spot!

• **Steering.** Don't look for any bellcranks here. The Bullet doesn't have them—or their weight and bulk; instead, there's a direct link between the kit-supplied servo-saver and the front hubs. The servo is angled back in the chassis, pan-car style, to allow servo-saver clearance and to minimize bump steer.

• **Drive train.** The Bullet uses a 3-belt system. Short, front and rear belts of equal length join each ball diff to a pair of layshafts that, in turn, are joined by a long center belt that spans the chassis. A single ball bearing serves as a roller to pinch the belt against the front pulley to prevent skipping. The rear layshaft is connected directly to the spur gear. Unlike most other touring chassis that cantilever the spur gear off the layshaft, which leaves the end of the shaft unsupported, the Bullet incorporates a thick aluminum tie rod to stabilize the outside end of the layshaft. The tie rod has an oversize eyelet with a bearing to minimize friction as it prevents shaft wobble and deflection.

The front and rear ball differentials went together fairly easily, although I was a little skeptical about the outdrives; the contact patch for the diff ring appeared too small. As if to answer my concerns, I received an update package with a new set of outdrives that is now included with the kit, and the new parts are now standard equipment. The completed diffs are quite smooth, but be sure they're tight before you install them. Once in the car, they cannot be adjusted without disassembly (FSR will have a new externally-adjustable diff soon).

Since this is a full-blown race sedan, it includes a full set of 26 ball bearings. Universal axles transfer the power to the wheels, and 12mm, machined-aluminum hex hubs accommodate all popular touring-car rims. FSR includes a full set of fluorescent yellow Pro-Line Warlock rims with some very sticky tires complete with foam inserts (also from Pro-Line).

TEST GEAR

Like many other race kits, the Bullet does not include a body. I chose a Mazda RX-7 body from Elite* for the testing. The body has a blunt yet aerodynamic nose and a

YOU'LL NEED

- 2-channel radio system.
- One servo.
- 6-cell saddle-pack battery.
- Battery charger.
- ESC.
- Motor.
- Lexan body.
- Lexan-compatible paint for the body.
- CA glue for tires, diff halves and drive pulleys.

FACTORY OPTIONS

- Titanium
 - Arm-pin set—part no. FO-01.
 - D-8 adjustment ball—FO-02.
 - Transmission shaft (F/R)—FO-04/FO-05.
- One-way drive pulley transmission shaft set—FO-13.
- Anti-roll-bar kit (F/R)—FO-14/FO-15.
- Stick-pack battery tray—PP-15
- Ball diff complete with bearings—FO-21.
- Aluminum
 - Servo mounts (L & R) pair—FO-17.
 - Upper A-arm mount—FO-25; 5°—FO-26.
 - Front bulkheads—FO-27.

PERFORMANCE

I took the car to my home track (and frequent stop of the *R/C Car Action* crew), R/C Madness in Enfield, CT. The challenging asphalt circuit was the perfect venue to test this competition sedan. The track's most notable feature is its long back straight that empties into a rippled braking zone. It's not uncommon to see sparks coming from the rear of some cars as their chassis screws scrape over the rough surface under hard braking!

I was immediately impressed by how easy to drive the Bullet was in box-stock form. I did notice, however, that the sidewalls of the tires would roll under and cause a slight, twitchy push condition on the tightest, hardest turns. To remedy the inconsistency, I swapped the kit tires for a set of pre-mounted Pro-Line* slicks. I went out again, and the car was just about dialed.

The floating rear body mount is an excellent idea, but it seemed to make handling inconsistent; when the car was off power, the rear end became a little squirrely. I'm not giving up on it yet, but I am holding on to the idea of mounting FSR's new, optional fixed rear body mounts. For tracks with long straights and sweeping turns, how-

ever, the floating system may be ideal.

The Bullet's rear toe is easily adjusted and proved to be very helpful as the day of racing progressed. As the track cooled and the traction went away, I dialed in a little more toe in the rear to help stabilize the car. Over the course of two qualifiers and a

With this large front bumper, the Bullet's nose is deadly to any car that gets in its way. It's just a little extra protection for the stout suspension components and universal axles.

large wing that should work well at the test track.

I had picked up a new JR Racing* R-1 radio just before I received the Bullet, so its included R-200 receiver went directly from carton to car. I picked a KO Propo* PS-1002 FET servo for the steering needs and soldered a Tekin* G-10 speedo to a Trinity* D3 10x2 motor and a set of matched Trinity 2000 Ex-Tech cells—top-shelf stuff for a top-shelf car.



likes

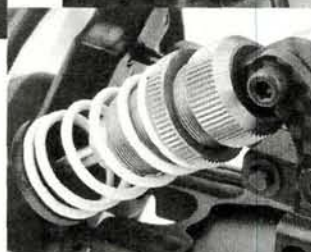
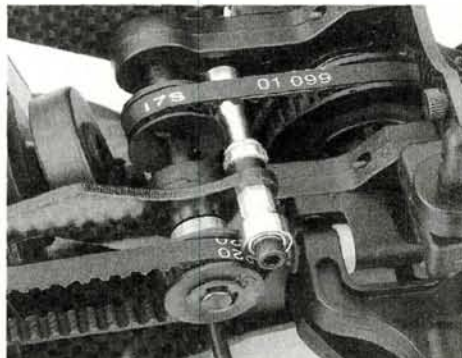
- Easy to build.
- Ball bearings throughout.
- Handy Allen tool included.
- Efficient, quiet drive train.
- Top-quality threaded-body shocks.



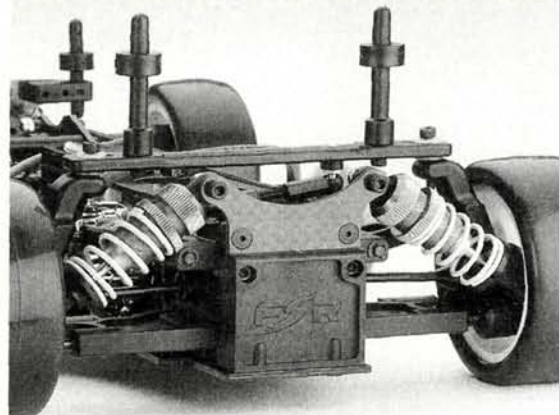
dislikes

- Extensive disassembly required to adjust the ball diffs. (Externally adjustable diff available soon.)

One long center belt drives the short front and rear belts. A ball-bearing roller prevents the belt from skipping.



The Bullet's blue-anodized aluminum shocks are a snap to adjust. Twist the knurled collar above the spring to adjust tension. No shims!



The graphite rear shock tower and hubs offer only one shock-mounting location.

Main (and a lot of practice packs), the car's 3-belt drive train proved extremely smooth and quiet. With help of the Trinity 10-turn double, the car ripped down the straightaway, and the Tekin G-10 was easily programmed for the ample braking needed to hustle the car around the tight course.

FINAL THOUGHTS

For the sedan driver looking toward the next level of competition, I feel confident recommending the FSR Bullet. Its quality, adjustability and handling characteristics put it among the top contenders. The quality of materials is excellent. All the pieces went together without any alteration, the instructions are easy to understand, and the photographs make it simple to identify parts and assembly procedures. A pleasant surprise was the supplied assembly measuring tool, which took the guesswork out of measuring the distances for tie rods, upper and lower A-arms and other sensitive, adjustable components. The combination of competition performance and user-friendliness is sure to be appreciated by all. The Bullet is a good car—something different, for sure—and it works.

**Addresses are listed alphabetically in the Index of Manufacturers on page 209.*

THE COMPETITION

	Kyosho TF-3	Yokomo YR-4 M2	Tamiya TA03F-Pro	HPI RS4 Pro	Schumacher SST 2000 '98	OFNA Z10	Roadrunner XPress	FSR Bullet
Wheelbase	10.3 in.	10.125 in.	10.1 in.	10 in.	10 in.	0.15 in.	10.25 in.	10.03 - 10.2 in.
Width	7.75 in.	7.25 in.	7.19 in.	7.25/7.125 in.	7.25 in.	7.48 in.	7.25 in.	7.2/7.5 in.
Weight	3 lb., 5 oz.	3 lb., 2.5 oz.	3 lb., 8.7 oz.	2 lb., 8 oz.	3 lb., 2.75 oz.	3 lb., 2.5 oz.	3 lb., 2.8 oz.	3 lb., 3 oz.
Diff type	Gear	Ball	Ball	Ball	Ball	Ball	Ball	Ball
Chassis	Double-deck	Graphite	FRP**	Carbon-fiber	Fiberglass	Graphite	Carbon-fiber	Woven graphite
List price	\$259.99	\$425	\$356	\$329	\$369	\$379.95	\$385	\$425
Available at*	\$219.99	NA	\$199.99	\$259.99	\$225	\$215.99	\$225	NA
Reviewed in	1/98	11/97	10/96	10/97	12/96	4/97	4/97	9/98

*Prices vary with location. **Fiberglass-reinforced plastic.

thrash
TEST

1/10 scale electric

Schumacher **Fireblade USA**

by Eugene You



THE ORIGINAL SCHUMACHER* Fireblade was nothing if not unique. With its swoopy low-slung body, atypical plate chassis and dramatically laid-down shocks, there was no mistaking the Fireblade for any other buggy. Schumacher has not rested since fielding the original Fireblade, however. With plenty of input from team drivers and an eye toward American-style racing, a new car has been developed that retains much of the original flavor but shows some dramatic changes.



the American dream



After months of prototype testing, Schumacher now introduces a much massaged version of the Fireblade 2WD off-road buggy—a USA version designed to handle the rough stuff, which is what stateside off-road racing is all about. I jumped at the chance to see whether the new 2WD Fireblade USA is as ferocious as its competition!

PHOTOS BY WALTER SIDAS



specs

SCALE 1/10
LIST PRICE \$309

DIMENSIONS

Length overall 15 in.
Wheelbase 10 1/4 in.
Width (F/R) 9 3/4 in.

WEIGHT

Gross, RTR 3 lb., 5 oz.

CHASSIS

Type Double-decker
Material S1 composite

DRIVE TRAIN

Type Ball
Primary Spur and pinion
Transmission Blade universal drive shafts
Differential(s) Ball
Slipper clutch No
Bearings/bushings Bearings and bushings

SUSPENSION

Type Front: lower A-arm w/active caster turnbuckle upper link
Rear: lower A-arm w/turnbuckle upper link
Damping Oil-filled plastic-body shocks

WHEELS

Type (F/R) 3-spoke plastic
Dimensions (DxW) Front: 2.15x3/4 in.
Rear: 2.2x1 1/4 in.

TIRES

Front/rear Pink compound mini-pin

ELECTRICS

Not included

THE KIT

• **Chassis.** The double-deck chassis is constructed of Schumacher's S1 composite and is braced to eliminate unwanted flexing. S1 is a type of woven fiber that doesn't conduct electricity; that means no "gremlins-in-my-car" type of radio glitches! The front and rear shock towers are made of the same material—no need for hop-ups here!

On the bottom chassis plate,



The Fireblade USA features a heavily braced, extremely rigid, double-deck chassis that's made of Schumacher's S1 composite.

there are seven slots for the Ni-Cds. This is helpful when you want to move the batteries forward or backward to tune for proper weight distribution.

Also on the bottom plate is a semicircular cutout that allows you to adjust the servo horn (if necessary) without removing the servo.

• **Shocks.** The original Fireblade USA had laydown shocks, which, although great for tight turns, were less able to handle very rough tracks and the big jumps typical of American tracks. The shocks in the Fireblade USA stand up closer to vertical and should be ready to handle all the

bumps and rough stuff that you can throw at them.

The shock bodies are plastic, and the seal assembly screws in from the bottom. Inside each shock is an innovative volume-compensating foam sleeve that absorbs oil when the piston is compressed and releases it on the rebound. Schumacher's Vari-shock pistons are featured. These use a 2-piece design that allows the piston to be set up with a single open hole, or up to four holes, without changing pistons. However, it is still necessary to open the shock body to adjust the piston.

• **Suspension.** If a car's A-arms flex, you get erratic suspension perfor-

YOU'LL NEED

- 2-channel radio.
- Electronic speed control.
- Steering servo (high-speed preferred).
- 6-cell battery pack.
- Battery charger.
- Motor.
- Paint for the body.
- CA glue for the tires.

FACTORY OPTIONS

- QC slipper clutch set (requires slipper layshaft)—part no. U823.
- Slipper layshaft—U1414.
- Visco Drive unit (requires layshaft)—U1787.
- Layshaft for Visco Drive—U1791.
- Pro shock absorbers (alloy), F/R—U1356/U1358.
- Alloy idler gear—U1607.
- Front swaybar—UU2090.
- Rear swaybar—U2091.
- Rear hub carrier—U1796 (1 degree toe-in), U1797 (2 degrees), U1798 (3 degrees), U1799 (4 degrees).
- Alloy pivot-pin blocks—U1988 (0 degree).

BUILDING & SETUP TIPS

■ Trial-fit most of the parts before you secure them; the instruction manual is good, but it relies on pictures instead of written directions.

■ To avoid stripping the heads of the Posi-type screws used in this (and other) Schumacher kits, get the correct Posi-driver from Schumacher or a specialty hardware store.

■ There are some sharp barbs on the chassis that need to be filed down before beginning assembly. While you're at it, file the sides of the chassis (top and bottom) and run a bead of CA glue along them to protect the edges from delamination.

■ Page 3, step 2. Bag 3 contained two different bottom mounting pivot blocks. One was loose in the bag, and the other was connected with flashing to the front A-arms. I used the latter, but there's no mention of these pieces in the manual.

■ Page 3, step 3. Slightly tap in the steering block tube from the bottom of the steering knuckle, then slide in the SACS pivot ball right-side up.

■ Page 4, step 8. When securing the bellcranks to the front bulkhead, tighten everything down firmly, then back the screws off until you have completely free movement. You might also want to lightly coat the brass steering bushings with Associated* black grease.

■ Page 8, step 4. Here's the easy way to mount the rear A-arm. Put the stepped pivot pin into the 3-degree toe-in block, then slide the rear A-arm into the pivot pin. Next, insert this assembly into the rear pivot strap. Note to first-time builders: make sure you bolt the pivot pin correctly, as indicated by toe-in when the assembly is complete. Toe-in simply means the fronts of the rear wheels will point slightly inward (viewed from the top). Believe me, I've seen novices mount rear suspension blocks in all sorts of unique ways!

■ Page 9, step 1. Be careful as you put the shock pistons together. The bottom side of the top piece has a curved and slotted recess that takes the tab on the lower piece—a design that allows you to tune damping by having one to four of the piston holes open.

■ Adjusting the turnbuckles can be frustrating. After I installed the completed camber and steering tie rods on the ball joints, everything was fine until I tried to adjust camber and toe-in. When I twisted the turnbuckle, the ball cups popped off the ball studs! After some contemplation, I found the solution: before threading on the ball cups, lightly coat the threads on the tie rods with grease (I used Associated's black grease). Next, tighten the ball cups all the way in, then back them out a few turns. The tie rods no longer pop off the ball cups whenever I make adjustments.

SCHUMACHER FIREBLADE USA

mance that wreaks havoc on handling, no matter how well the suspension has been set up. Knowing this, Schumacher has provided the Fireblade with very stiff "performance engineered polymer" arms that should maintain their geometry no matter how rough the course.

• **Steering assembly.** The dual-bellcrank steering assembly is bolted to an angled front bulkhead and further supported by a steering-post brace bolted directly to the top chassis. The assembly is silky smooth and hardly flexes at all, and the adjustable servo saver is a welcome feature.

• **Transmission** has a final ratio of 2.0. This tranny has a very low rotating mass and should offer rocket-like acceleration. A major disappointment is the absence of a slipper clutch—oh, no! Because racing in Europe means high-grip conditions, Schumacher felt there was no need for one. But where I race and practice, I run motors ranging from 10 to 13 doubles, just to keep up with the Joneses. And believe me, when you run such monstrous ponies, you need a

slipper! Since the stock class is very popular, I will try the car's direct drive with a healthy stocker, just to be fair.

Kudos to Schumacher for the hard-anodized aluminum-alloy diff halves and the super-stiff tranny casings. Final power transfer is achieved by means of unique shafts. Schumacher has incorporated plastic, U-shaped "blades" that pad the steel drive pins and provide a slop-free fit with the outdrives. This combination is race proven and durable; I know because I own a Schumacher CAT '98 4WD with the same axles.

• **Body.** Low and aerodynamic, the Fireblade has a particularly distinctive look. I called on a local painter, Todd Amann, to design and paint the gorgeous scheme shown here. Thanks, Todd! A Lexan undertray keeps out dirt and it secures the body with the supplied Velcro®-brand-fastener strips. Right on! No more body clips! Let's not forget the breakaway wing mounts; in crashes, the rubber O-rings that secure the wing give way and the wing survives.

• **Wheels and tires.** Front and rear yellow 3-spoke rims are shod with Schumacher's Pink compound mini-pins. In keeping with the "USA" theme, these tires should work



The Fireblade USA features a more conventional "standup" shock configuration to improve rough-track handling. The front suspension features the Schumacher Active Caster System (SACS) that gradually increases caster angle when the suspension is compressed to give increased turn-in steering. Love that mini-bumper!

well with the "blue groove" tracks often encountered here in Southern California.

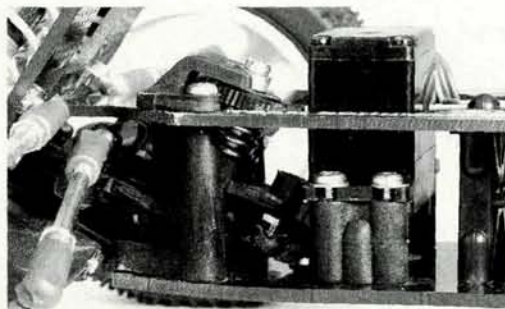
TEST GEAR

- Airtronics* Caliber 3PS radio system.
- JR Racing* NES-2700G high-speed steering servo.
- LRP* V6 electronic speed control (ESC).
- Reedy* Zapper batteries (Sanyo RC 2000 matched cells).
- Reedy Firehawk 24-degree stock motor.

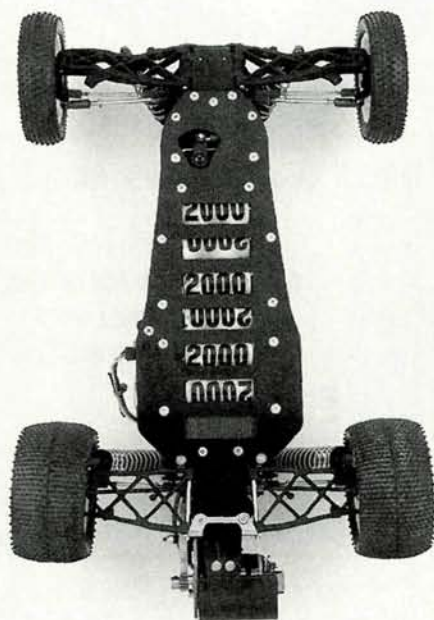
PERFORMANCE

My local track is So Cal Raceway in Huntington Beach, CA, and I decided to test the Fireblade first in box-stock configuration in the stock class. I had driven only modified motors for a long time, but the Fireblade made it very easy for me to adapt. The LRP V6 ESC was very smooth and ran flawlessly, and the Reedy Firehawk and Zapper batteries reminded me that I had plenty of horsepower when I pulled full throttle.

(Continued on page 185)



Above: unique, angled steering bellcranks contribute to the Fireblade's potent handling. Left: the new chassis has seven battery slots. This allows you to position the battery pack forward or backward as a tuning aid. Note the access window for the servo-horn. Below: a new one-piece rear shock tower offers many camber-rod and shock-mounting locations. The plastic-body shocks worked well and may be tuned without changing pistons or shock oil—a very handy feature.



Likes

- Great suspension.
- Plenty of steering.
- Easy servo access.
- User-friendly no-clip body with undertray.
- Extra-rigid chassis and suspension components.
- Excellent tires for blue-groove conditions.
- Awesome blade-type universal



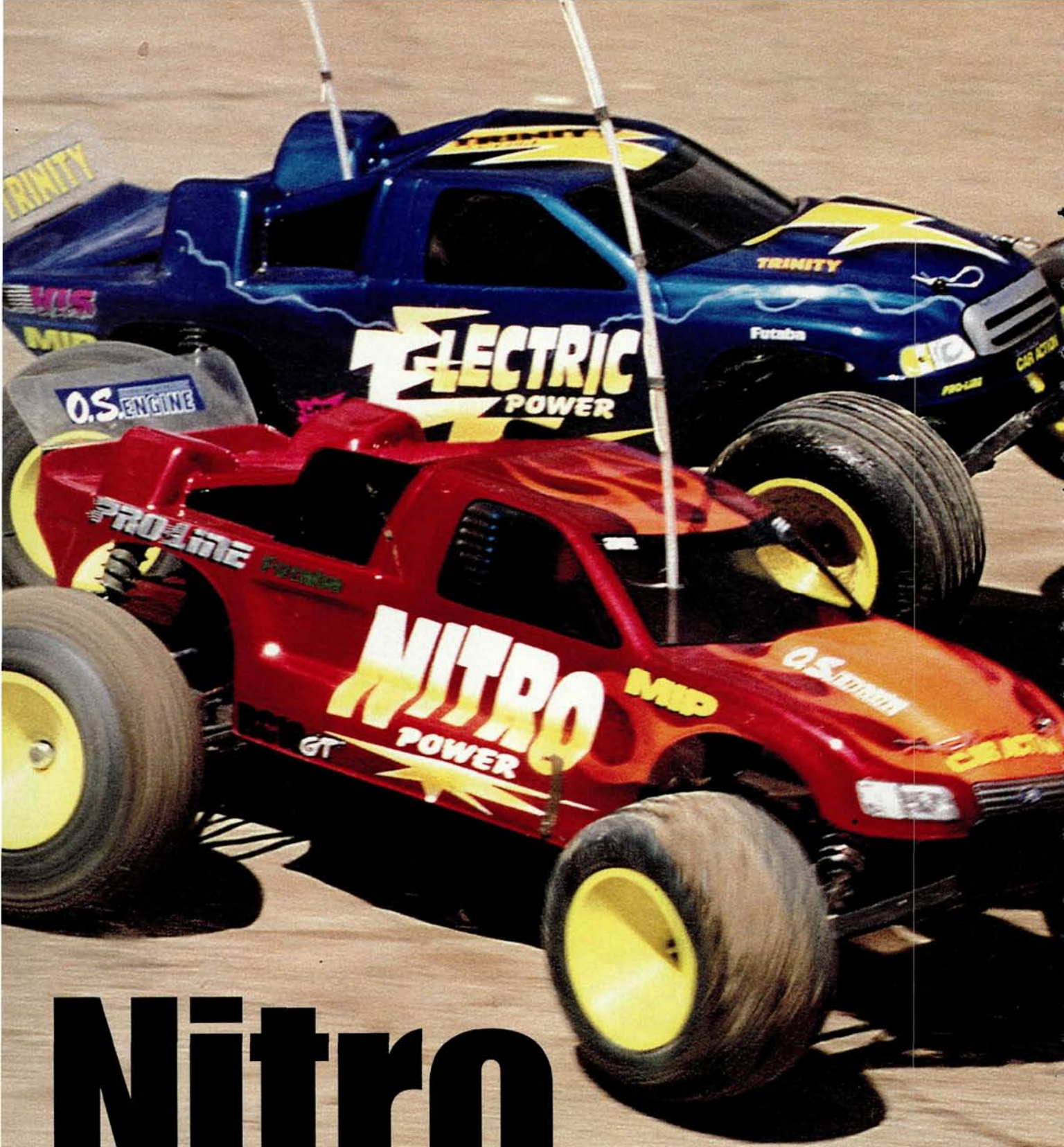
dislikes

- No slipper clutch.
- Although the plastic shocks worked very well, I feel a vehicle of this price should come with hard-anodized shocks.

THE COMPETITION

	Losi DOUBLE-X 'CR'	Associated RC10B3	Schumacher FIREBLADE 2000
Wheelbase	10.625 in.	10.5 in.	10.717 in.
Width	9.3 in.	9.625/9.75 in.	9.85 in.
Weight	3 lb., 8.5 oz.	3 lb., 4 oz.	3 lb., 4 oz.
Diff type	Ball	Ball	Ball
Chassis	Composite	Composite	Woven S1 fiber
List price	\$309.95	\$320	\$309
Available at*	\$186.99	\$178.99	\$189.50
Reviewed in	11/96	3/98	11/97

*Prices vary with location.



Nitro vs. Electric

by Steve Pond



WHICH IS BETTER: nitro power or electric power? This question has been asked almost as often as the "chicken or the egg" thing. If you're involved with R/C cars, you're probably more familiar with electric power. With the recent surge in nitro's popularity, however, the question has been coming nonstop. So, with 17 years of R/C experience, I've plumbed the depths of my knowledge and conducted months of tests to answer this burning question.

And the answer is ...

... it depends on who's asking. We all have our own ideas about what we want from our R/C vehicles—durability, ease of use, blis-



Which is best?

tering top speed, economy, etc. My preferences are based on what I enjoy, but it's what's important to *you* that matters here. I've tried to give as much information as I can on the choices (including which is fastest), so you'll be able to decide for yourself which is better.



TEST BEDS

Since most of our readers (that's you) ask about off-road vehicles, we chose the best-selling racing trucks from Team Associated* as our test subjects: the nitro RC10GT and the electric RC10T3, both in Team versions. These fully optioned machines compete regularly at the national level. Though the GT's design is more similar to that of the older, T2 electric truck than to the latest T3, both are at the top



of their game and should provide a level playing field when it comes to comparing power trains.

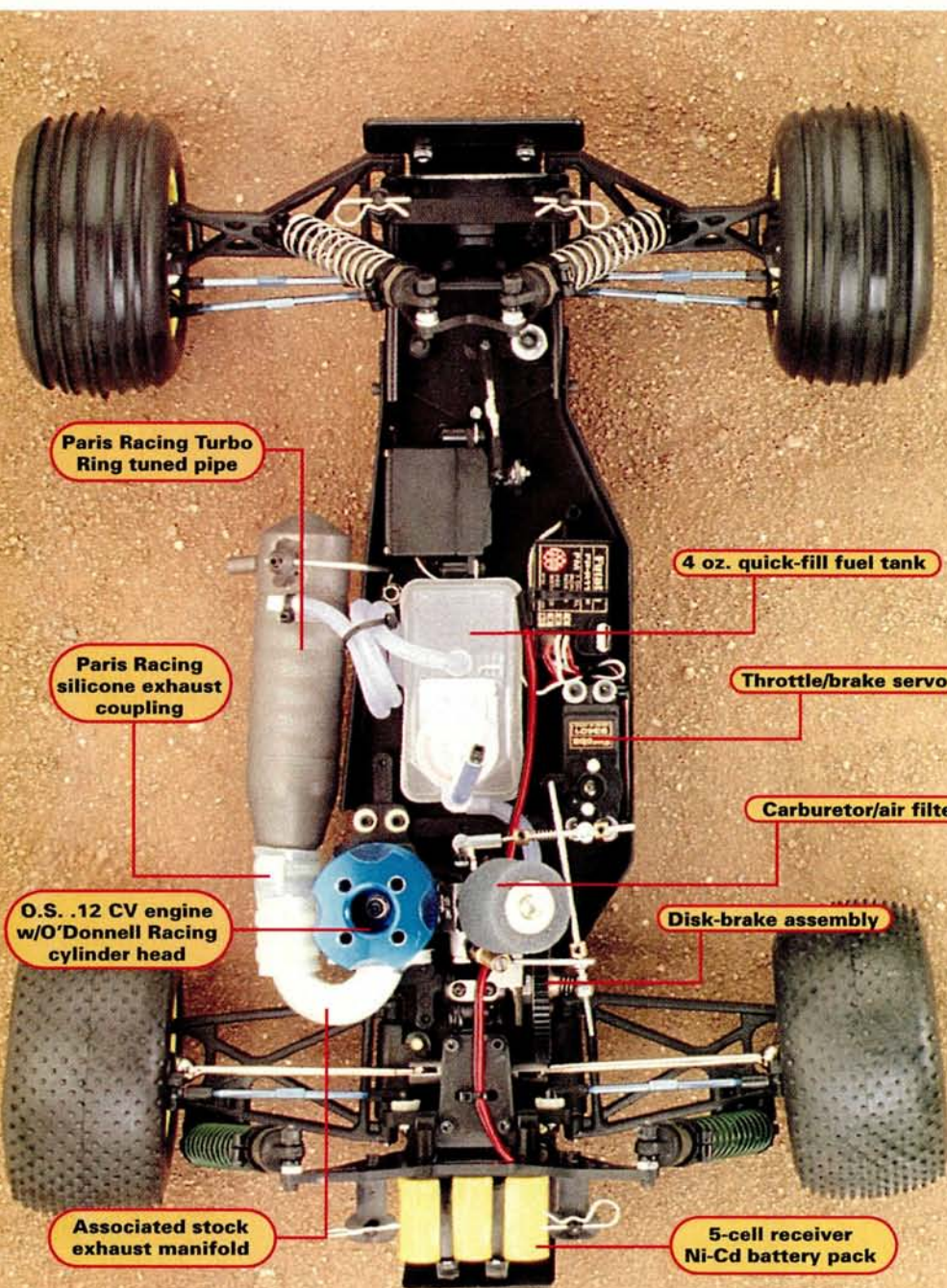
THE CONTENDERS

Nitro power. I chose the O.S.* .12 CV engine—the top-selling powerplant among racers. The CV and its predecessor, the O.S. CZ-Z, virtually dominate the winners' charts at most events. Their precision carbs are very good at holding needle settings (makes tuning easier), and they develop plenty of horsepower.

For the test, my only change to the



The nitro power train is certainly more parts-intensive than the electric. Despite its "heavy" looks, the nitro system is actually a little lighter.



NITRO Associated RC10 GT

DIMENSIONS

Wheelbase 11 in.
Width (F/R) 12.25/12.5 in.

WEIGHT

Gross (as tested) 3 lb., 12 oz.

CHASSIS

Type Tub
Material Aluminum

DRIVE TRAIN

Transmission Sealed 3-gear
Differential(s) Ball
Slipper clutch Single-pad friction
Bearings/bushings Bearings

GEARS

Clutch bell/spur Robinson Racing
15T/67T

SUSPENSION (F/R)

Type Lower A-arm w/adj. upper link
Damping Aluminum oil-filled coil-over shocks

TIRES (F/R)

Type Pro-Line Edge
M2/Bow Tie M2

DRIVE TRAIN

Engine O.S. .12 CV
Clutch MIP 4-shoe w/heavy flywheel
Exhaust Associated manifold/Paris Turbo Ring pipe

Paris Racing Turbo
Ring tuned pipe

Paris Racing
silicone exhaust
coupling

O.S. .12 CV engine
w/O'Donnell Racing
cylinder head

Associated stock
exhaust manifold

4 oz. quick-fill fuel tank

Throttle/brake servo

Carburetor/air filter

Disk-brake assembly

5-cell receiver
Ni-Cd battery pack



CV was to swap the heavy factory cylinder head for a lighter, after-market unit from O'Donnell Racing* for better cooling. I chose the Paris* Turbo Ring tuned pipe mounted on a stock Associated manifold. Gearing is by Robinson Racing* in the form of Absolute spurs and clutch bells. These gears are precision machined, and to eliminate runout, the new clutch bells are now one piece.

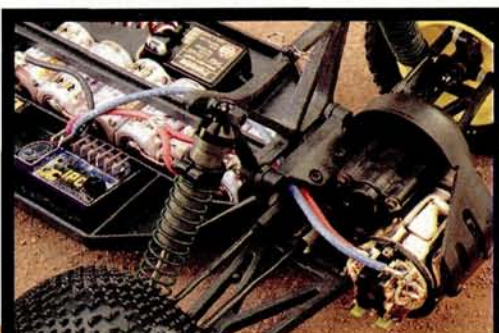
Futaba's* flagship 3PJ radio system and S3403 servos provided steering and throttle control.

Electric power. I chose Trinity* motors and batteries—the top sellers in both categories. I coupled a Trinity D3 12-turn double motor with Trinity VIS Matched

Team packs. Getting the power from the batteries to the motor is LRP's* top-of-the-line programmable electronic speed control (ESC), the IPC



V6 ESC. Gearing was again by Robinson Racing, and I again used Futaba's 3PJ for guidance.



The electric power train is the definition of simplicity; it's comprised of only three parts: motor, speed control and battery!

ELECTRIC **Associated RC10 T3**

DIMENSIONS

Wheelbase 11.375 to 11.5 in.
Width (F/R) 12.5/12.5 in.

WEIGHT

Gross (as tested) 3 lb., 15 oz.

CHASSIS

Type Molded semi-tub
Material Composite-reinforced plastic with aluminum front and rear plates

DRIVE TRAIN

Transmission Sealed 3-gear
Differential(s) Ball
Slipper clutch Single-pad friction
Bearings/bushings Bearings

GEARS

Pinion/spur Robinson Racing
18T/87T

SUSPENSION (F/R)

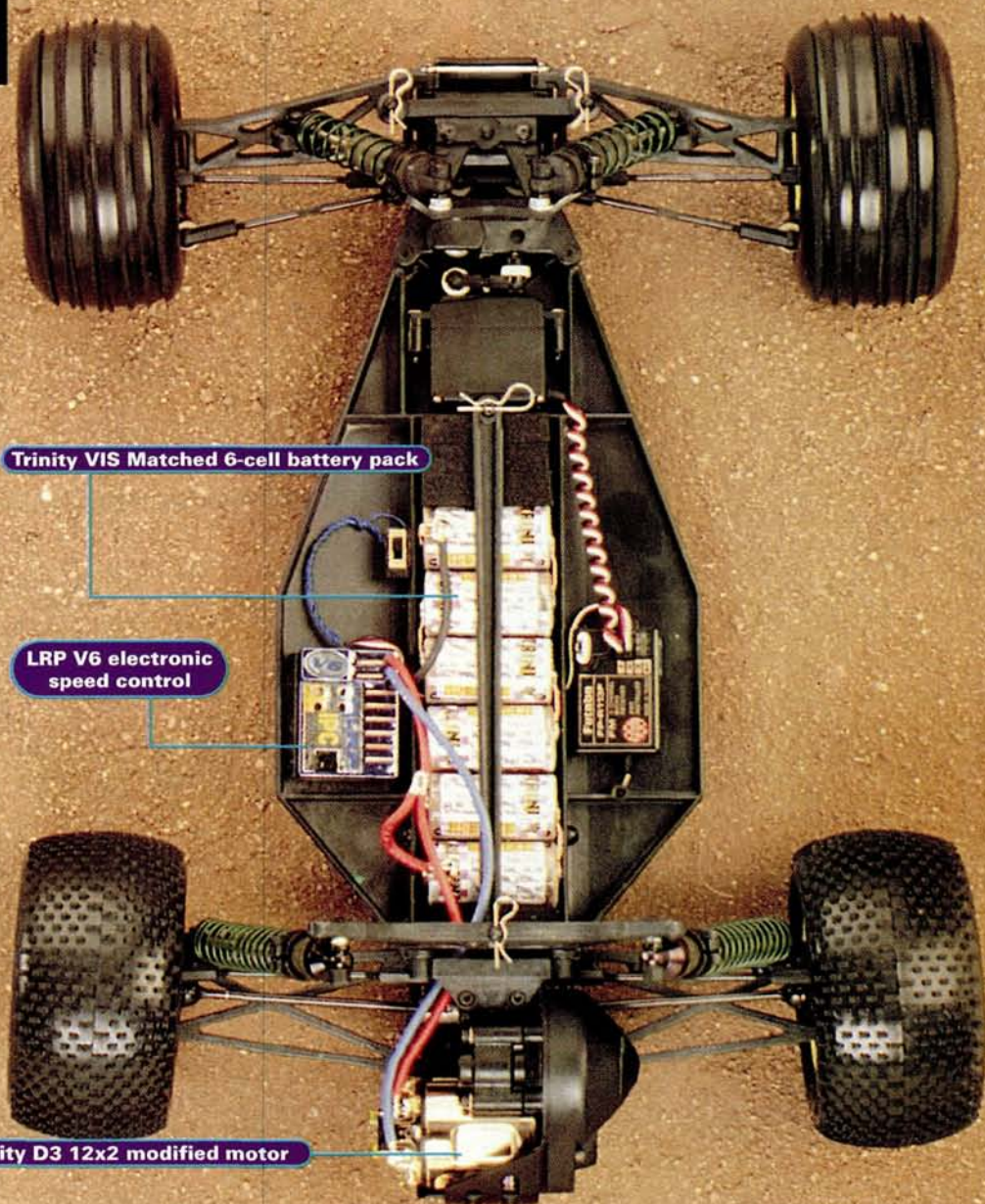
Type Lower A-arm w/adj. upper link
Damping Aluminum oil-filled coil-over shocks

TIRES (F/R)

Type Pro-Line Edge
M2/Bow Tie M2

ELECTRICS

Motor Trinity D3 12x2
Battery Trinity VIS Matched Team Pack
ESC LRP IPC V6



The need for speed

"Which are faster—nitro- or electric-powered cars?" Wish I had a buck for every time I've been asked that. Top speed is only one aspect to consider when determining which kit would be the "best," but for many, this appears to be one of the most important aspects (if nothing else, it's a very popular point of discussion). And most of us (including me) have always assumed that nitro power is faster than electric. And let's face it, even editors of R/C car magazines rarely get the chance to test both forms of power on a similar chassis, on the same track or surface, on the same day.

This summarizes the results of our testing and shows speed results obtained in three types of situations:

- on a racetrack;
- straight-line speed using a racetrack setup;
- geared up for maximum speed.

Racetrack

We headed to R/C Madness in Enfield, CT. One of its many racing venues is a well-groomed medium-size off-road track that caters to all forms of off-road racing, up to the 1/8-scale nitro monsters. When assistant editor Greg Vogel and I were able to turn in consistent lap times, there was little difference—if any—between the nitro and electric trucks. If one had any edge at all, it was the electric truck to the tune of less than 1/10 second.

In case our results were biased by our driving skills, I went through the results of the recent Reedy Truck Race of Champions held at the Ranch Pit Shop in Pomona, CA, to look at the results of top-level professional drivers. The top three drivers' average lap times in their respective A-mains were almost identical (24.80-second average for the nitro trucks, and 24.79-second average for electric).

■ Advantage—neither.

We were able to get exact speed readings for both trucks with the assistance of the Ridgefield Police Dept.



Straight-line speed

I enlisted the help of the local (Ridgefield, CT) police department to check straight-line speeds on their radar. Using the same gearing setup as on the racetrack, the electric truck clicked off a best of 30mph, and the nitro truck, after a little warmup, managed a top speed of 34mph.

■ Advantage—nitro.

Top speed

With the police cruiser standing by, we reached into our bag of Robinson Racing goodies and grabbed a set of gears that we hoped would net the highest speeds possible from both trucks (don't try this at home).

First to roll through the traps was the electric truck with a best effort of a very impressive 36mph. The nitro truck took some time to spool up to top speed, but when it got there, it nearly sucked the decals off the side of the police car with a run of just over 40mph! That equates to covering almost 60 feet (the length of a fairly large house) in 1 second!

■ Advantage—nitro.

WHICH IS BEST?

Cost. The start-up costs for both types of vehicle are remarkably similar (see sidebar, "Tale of the Tape"). At the "budget" end, both trucks start at around \$340, ready to go, but as you creep up toward the best of everything, the gas-powered version actually starts to show a slight cost advantage.

My analysis also includes running a 14-week racing season. If you were to run two qualifying rounds and a Main, an electric vehicle would net you 12 minutes of track time, whereas nitro truck races typically run for up to 1 hour! So if you factor wheel time into the equation, it's another plus in the nitro column.

■ Advantage—nitro.

Ease of assembly/setup.

Both trucks took about the same time to assemble—up until the installation of the power train. Electric setup is relatively painless; in most cases, you simply push a few buttons and you're ready to hit the track—usually in about 1 minute.

Nitro is a different story: components such as the clutch, carb, fuel lines, linkages, an extra servo and an exhaust system all make setup a little more complex. The complications arise when you have to adjust all these components to provide optimum performance.

■ Advantage—electric.

Tuning and maintenance.

Other than the initial setup, an electric vehicle requires very little tuning and maintenance. If you race, you'll have to tune both chassis equally for optimum performance.

An electric motor requires very little attention; just follow some simple maintenance procedures, and you can be pretty sure to have a trouble-free run.

Nitro engines require an entirely new set of skills if you're to make them run consistently. Obtaining the correct fuel mixture is crucial, and this alone is a source of confusion and frustration for many nitro newbies.

■ Advantage—electric.

Run time.

In organized electric racing, vehicles are usually required to run for 4 to 5 minutes—max (1/12 4-cell racing requires runs of 8 minutes). With more conservative gearing, an electric truck can run longer, but this comes at the expense of performance.

Nitro is another story; 6- to 8-minute runs may be expected from a 4-ounce tank of fuel, and while the engine is running, you can refuel as often as your fuel supply will allow.

■ Advantage—nitro (big time).

Performance.

Which is faster? This is the most often asked question in the nitro-versus-electric comparison. You might be surprised to learn that, in competition, the vehicles' lap times are very close (see sidebar, "The Need for Speed").

Electric motors develop tremendous torque that gives them a minute advantage in tight quarters. Nitro engines, however, tend to overcome any electric advantage when they get a little breathing room on a longer track; with more top-end power, the gas truck can easily pace the electric.

In testing and racing during the most recent Reedy Truck Race of Champions, Gene Husting of Team Associated said his electric truck drivers were less than 1/10 second faster than the nitro-powered ones. When running in a straight line, the nitro truck was 10 percent faster than the electric. When both were geared for all-out speed, the 4mph nitro advantage was maintained, although both cars were running about 20 percent faster—a blistering 40mph performance with nitro and a respectable 36mph from electric power.

■ Advantage—nitro.

TALE OF THE TAPE

The costs of owning and operating nitro and electric vehicles cover a broad range. This chart shows the basic start-up expenses involved in operating both types of vehicle. The "Budget" column for each category shows minimum start-up costs using the most inexpensive equipment available. The "Competition" column shows the other extreme—the best and most expensive of everything.

NITRO	BUDGET	COMPETITION
Kit	\$167	\$237
Radio	\$62	\$389
Engine	\$87*	\$79
Fuel (1 gallon)	\$29	\$29
Starter box	—	\$100
Extra servo	—	\$59
Receiver batteries	\$5	—
Ni-Cd receiver pack	—	\$25
Trickle-charger	—	\$12
Ni-Cd glow starter	—	\$17
Totals	\$350	\$947
Additional costs of racing a 14-week season		
Fuel	\$135	\$135
Glow plugs (4)	\$28	\$28
Totals overall	\$513	\$1,110

*Pull-start engine

ELECTRIC	BUDGET	COMPETITION
Kit	\$159	\$188
Radio	\$62	\$389
Motor	—	\$55
Batteries (3)	\$42	\$240
Charger	\$38	\$120
ESC	\$40	\$140
Totals	\$341	\$1,132

Additional costs of racing a 14-week season		
Motors (2)	\$58	\$110
Brushes	\$24	\$24
Battery (1)	\$14	\$80
Totals overall	\$437	\$1,346

FINAL THOUGHTS

Nitro-powered R/C vehicles can be very attractive. The sound of the engines and their potential for performance can add to the excitement, but nitro engines can be overwhelming to newcomers. There are plenty of exciting aspects to R/C, including learning how to drive, wrench and eventually race your vehicle. If you're new to R/C and unsure of which direction to take, I recommend that you

"cut your teeth" with an electric-powered vehicle. Electric power is more user-friendly and lets you focus on your vehicle's other elements—gearing, suspension adjustment and shock and spring tuning, for example. It would be wise to get comfortable with the non-drive-train components before you add a nitro engine into the equation.

*Addresses are listed alphabetically in the Index of Manufacturers on page 209.

REVERSING

FROM A TO Z: 20 WA

by Peter Vieira

RACING ELECTRONIC speed controls (ESCs) tend to get the most press (we're guilty as charged), but the forward-only boxes don't really suit the needs of the average R/C buff who drives just for fun. Reverse lets you back out of trouble and opens all sorts of doors to stunt-driving action. Any trick you've seen from Joey Chitwood, the Duke boys, Jim Rockford, or Knightrider (you know you watched it) is within the realm of R/C action when you have reverse. And if you're into scale R/C, reverse is a must. Would you really lavish your time and effort on, say, a Tamiya King Hauler without building in the ability to back up? I thought not.

Now, if you're reverse-less, the question is this: which reversing ESC should you buy? This guide will help you. Do you need a heavy-duty controller for a dual-motor monster truck? No problem. Looking for a low-budget unit to keep your stock-motor car moving in both directions? Gotcha covered. We've got every reversing ESC currently available (in alphabetical order) complete with features and specs for your shop-and-compare pleasure. It's time to move forward with going backward!

AIRTRONICS

A natural choice for use with your Airtronics radio gear, the Contender includes an integral heat sink to keep it cool, LEDs that indicate proper setup and servo-type mounting tabs that allow the unit to take the place of the servo usually used in a mechanical setup. The Contender is available separately or may be purchased with the Airtronics Rival or XL2P transmitters.

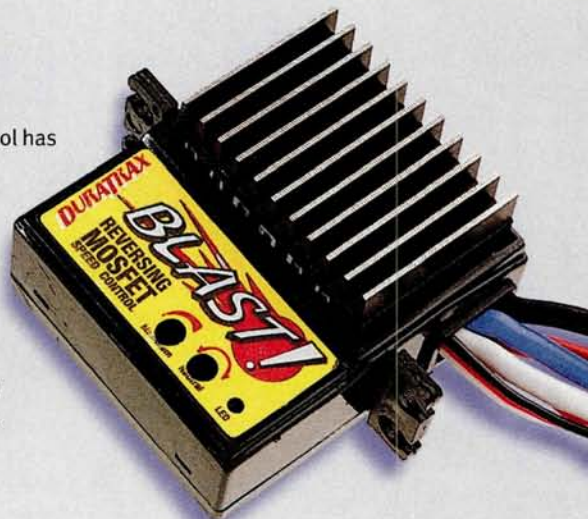


CONTENDER

- Integral heat sink.
- Manual setup with LED indicator for neutral and full throttle.
- Thermal-overload protection.

DURATRAX

If that 3-step mechanical speed control has breathed its last, consider adding DuraTrax's chunky Blast controller to your car. This inexpensive ESC features a reverse delay to help spare your gearbox and allow braking control, and a silicone-mounted heat sink provides ample cooling. Soft silicone insulated wires with factory-installed connectors and servo-type mounting tabs allow easy, drop-in installation in most vehicles.



BLAST

- Manual setup with LED indicator for neutral and full throttle.
- Removable servo-type mounting lugs.
- Silicone heat-sink boot for efficient cooling and FET protection.
- Fixed reverse delay (0.45 second).

Battery eliminator circuit (BEC): the term "battery eliminator" comes from the early days of R/C when electric vehicles still required a 4-cell receiver pack. The BEC in a speed control is actually a voltage regulator that supplies the receiver and servo with the voltage they need to operate. We've listed the BEC's output in volts and amps; if you plan to use high-power servos, try to get an ESC with a high-amp BEC.

Cells: when referring to an ESC, this means the number of cells it can safely operate with.

Current limiter: allows the user to reduce the current delivered to the motor to extend run time. A current limiter can also

be used to reduce wheelspin on slippery tracks, although with some units, this can also limit top speed.

FET (field effect transistor): a transistor in which the output current is controlled by a variable electric field. An FET is a voltage-controlled power device that can handle large flows of electrical current. The metal tabs on top of an ESC are the heat sinks for the FET (some tabs may also be for the voltage regulator, BEC, or brake).

Forward/reverse current: the maximum continuous current an ESC can deliver to the motor for forward and reverse throttle. Note: current ratings may not be comparable between brands (see "Resistance").

Frequency: to oversimplify, an ESC controls the voltage supplied to the motor speed by cycling the motor on and off many times per second. The number of cycles per second is the frequency. It is generally accepted that higher frequencies result in smoother throttle feel.

Manual setup: many ESCs now have push-button setup for quick calibration, but some are "manual" and require that the user turn one or two small knobs, or "pots," to set the ESC's neutral and full-throttle positions.

Motor limit: some ESCs overheat if asked to cope with the amp draw of a modified motor with very low winds, so their manu-

facturers specify the minimum number of motor winds they will work safely with.

Resistance: the amount of electrical resistance within an ESC's transistors. Resistance changes electrical energy into heat energy; for us, that means power is wasted as heat. The lower its resistance, the more efficient the ESC. The figures listed for resistance will help you compare speed controllers within each brand listing, but since manufacturers test resistance in different ways, one maker's rating may not be a reliable tool for comparison with another's. The same holds true for the forward and reverse current ratings.

ESC GUIDE

TO GET BACKWARDS

DYNAMITE

If you haven't upgraded to an ESC yet, you've no doubt noticed that your car's steering gets very sluggish and may even lock as the battery goes flat. The Dynamite Powerpulse features PowerBoost circuitry to prevent this, and it keeps you in full control right down to the last volt. A 1-second delay allows braking control to slow your machine before reverse kicks in, and a replaceable fuse protects the ESC against overloads.



POWER PULSE

- PowerBoost circuitry assures you of full steering control, even with a "dumped" pack.
- Reverse-polarity protected with replaceable fuse.
- One-second reverse delay.
- Proportional brake.

FUTABA

Futaba's reversing ESC includes an easily replaced automotive-type fuse to protect against overloading, LED setup indicators, 1-speed reverse and a built-in heat sink. This economical unit can handle modified motors down to 18 turns and features the high-quality construction for which Futaba products are known.



MC210CB

- Integral heat sink.
- Thermal-overload protection with replaceable fuse.
- Manual setup with LED indicator for neutral and full throttle.

Overload protection: this feature will shut down the ESC if it overheats because of overuse, a short circuit, or another problem. Once the ESC has been allowed to cool, it will operate normally. Most ESCs with this feature use thermal-overload protection to monitor the unit's temperature. If your ESC gets hot enough to activate this feature, find the cause and fix it!

Proportional brake: proportional control means that the car reacts in proportion to the input from the transmitter; for example, if you turn your transmitter wheel just a little, the car turns slightly. The farther you turn the wheel, the tighter the turn gets. Proportional brake can be applied gently for a gradual stop or

more heavily until you reach a wheel-locking spinout (or anywhere in between).

Proportional reverse: proportional reverse allows you to control reverse throttle from slow to fast and anywhere in between, just like forward throttle.

Push-button setup: this allows you to push a button to automatically calibrate your ESC to your radio's neutral, throttle and brake positions.

Reverse disable: once activated, this will allow full control of forward throttle and brake, but reverse will not function. This allows an ESC to comply with the rules of race-sanctioning bodies and most tracks, which prohibit the use of reverse in competition.

THEM'S THE BRAKES!

In the world of forward-only speed controls, the transmitter trigger activates forward throttle or brakes or rests at neutral—no problem; that's three modes of operation (forward, neutral, brake) from a three-position trigger. With a reversing ESC, however, the transmitter must activate four functions from that three-position trigger or, alternatively, eliminate the brake in favor of reverse. ESC manufacturers have devised some clever ways of incorporating reverse and brakes in their products; here are the options:

■ **Reverse delay**—provides the ESC with proportional brakes for a set time before activating reverse. In some cases, the time delay may be set by the user (Novak 610-HRV, Tekin Titan, Rebel), and in others, the delay is set by the manufacturer (Futaba, Hitec, DuraTrax, Dynamite, Airtronics). This feature is effective, but if you're still holding the trigger at full brake when the delay time is up, the car will go straight to full-throttle reverse.

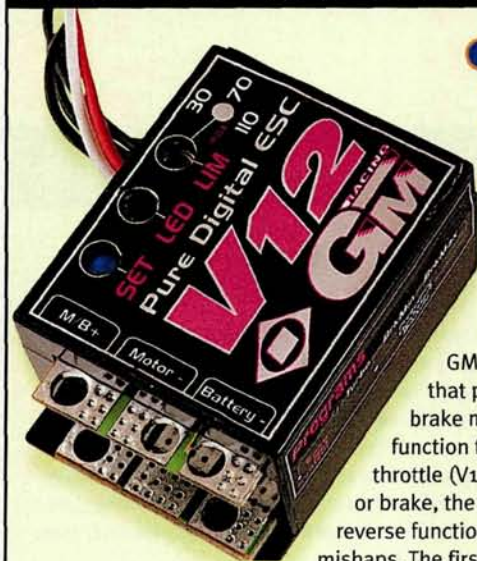
■ **"Smart" systems.** Novak's Smart Braking Circuitry and LRP's Intelligent Brake Control use similar strategies to reverse operation. Both ESCs contain software to prevent reverse from being engaged until the motor has slowed to a safe speed (Novak Rooster, Super Rooster) or stopped (LRP F1 Bullet, Power, Digital). Both systems protect the gearbox from being unnecessarily abused while providing the fastest possible safe transition from forward to reverse throttle.

■ **Double action**—used by the GM controllers and the new KO Legato. The first application of up-trigger is all brake; you can hold the brake full on as long as you like, and reverse will never kick in. Once the trigger has returned to neutral and up-trigger has been reapplied, proportional reverse is available. Although this does not actually lock out reverse, this may be good for part-time racers, since it offers unlimited braking, and very deliberate action is required to activate reverse. Ask the track operator if it's OK before you race.

■ **50:50 reverse trigger.** Only the LRP Runner uses this system. The first 50 percent of reverse trigger throw controls brake, and the remaining 50 percent is proportional reverse. It's effective, but you need a steady hand to get full brake without hitting reverse.

Novak's Super Rooster employs Smart Braking, which prevents reverse from engaging until the vehicle has reached a safe speed. Other ESCs employ different strategies for reverse engagement, which might affect your driving style.





V12/R

- Smallest reversing ESC available.
- Includes all the adjustable features of the forward-only V12 racing controller: Turbo function, minimum brake, maximum brake, frequency, current limiter and drag brake.
- Replaceable, externally soldered wires.
- Connectors aren't included; soldering skills required for installation.

GM RACING

GM's reversing ESCs offer a unique programming system that permits a patient user to adjust operating frequency, brake minimum and maximum and drag brake and has a Turbo function that overrides the current limiter for the first burst of throttle (V12/R, Pro and Champ models only). Once you slow down or brake, the current limiter is activated. GM's separate brake and reverse functions help spare the gearbox from full-throttle-to-reverse mishaps. The first application of reverse trigger applies proportional brake; after returning to neutral, the next application of reverse trigger activates reverse. The primary differences between models are "on" resistance and amp rating (check the spec chart); while the Sport has fewer features—no current limiter or Turbo mode. If you just want to plug in a GM controller and go, that's easy; factory-installed motor and battery connectors on the Pro, Champ and Sport ESCs combined with push-button setup make it easy to hit the street or trail in a hurry.



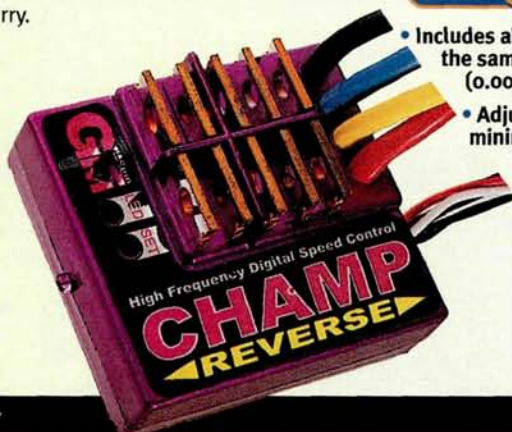
SPORT

- Includes many of the same features as the Champ, Pro and V12/R, including adjustable minimum brake, maximum brake, frequency and drag brake. Turbo function and current limiter not included.
- Same amp rate as Champ with higher resistance (0.004x2 ohm).



PRO

- Includes all the features of the V12/R, but has higher resistance (0.002x2 ohm) and lower amp rate.
- Adjustable Turbo function, minimum brake, maximum brake, frequency, current limiter and drag brake.
- Metallic case finish.
- High operating frequency (2000 to 4000Hz).



CHAMP

- Includes all the features of the Pro and has the same amp rate but higher resistance (0.003x2 ohm).
- Adjustable Turbo function, minimum brake, maximum brake, frequency, current limiter and drag brake.
- Metallic case finish.
- High operating frequency (2000 to 4000Hz).

PRODUCT COMPARISON CHART

MANUFACTURER	AIRTRONICS	DURATRAX	DYNAMITE	FUTABA	GM				HITEC
Model	Contender	Blast	Power Pulse	MC210CB	V12/R	Pro	Champ	Sport	SP560
Case dimensions (in.)	1.83x1.58x1	1.5x1.75x0.75	1.75x1.5x1	1.75x1.62x1	1.25x1x.75	1.63x1.5x0.5	1.63x1.5x0.5	1.63x1.5x0.5	1.5x1.75x0.75
Cells	6 & 7	5-7	6 & 7	6 & 7	6 & 7	6 & 7	6 & 7	6 & 7	5-7
On resistance (ohm)	0.0075 x2	0.0125	0.010	0.0062	0.001	0.002x2	0.003x2	0.004x2	0.009
Forward current (amps)	120	140	180	142	700	600	300	300	200
Reverse current (amps)	60	60	92	NA	230	360	90	90	150A
Frequency (Hz)	60	NA	60	NA	2000-4000	2000-4000	2000-4000	2000-4000	NA
BEC (volts/amps)	6/NA	5.6/NA	5.8/2	6/3	5.6/3	5.6/2	5.6/2	5.6/2	6/5
Motor limit	Stock	Stock	13 turn	18 turn	None	10 turn	12 turn	14 turn	16 turn
Overload protection	Thermal	Yes	Thermal	Fuse	No	Yes	Yes	Yes	Thermal
Battery plug	Tamiya type	Tamiya type	Tamiya type	Tamiya type	None	Tamiya type	Tamiya type	Tamiya type	Tamiya type
Receiver plug	Airtronics	Futaba	Futaba	Futaba	Futaba	Futaba	Futaba	Futaba	Universal
Motor plugs	Bullet	Bullet	Bullet	Bullet	None	Bullet	Bullet	Bullet	Bullet
Reverse disable	No	No	No	No	Yes	Yes	Yes	No	No
Warranty (days)	90	120	120	1 year	180	180	180	180	1 year
Proportional brake	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Proportional reverse	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Push-button set up	No	No	No	No	Yes	Yes	Yes	Yes	No
List price	\$99.95	\$89.95	\$89.95	\$89.95	\$220	\$160	\$129	\$89	\$99.95

*Transistor and diode rating at 25°C junction temperature.

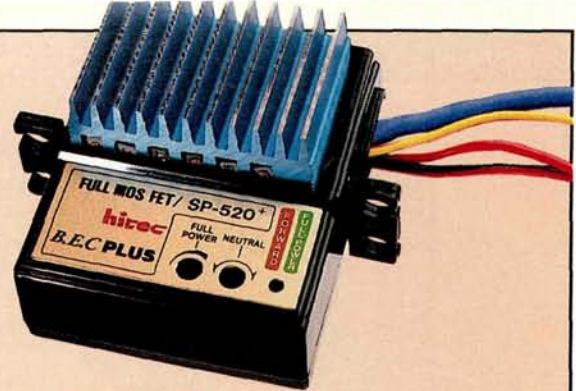
HITEC

If you're looking for reverse on a budget, Hitec's basic SP560 and SP520 Plus controllers are reasonably priced and an ideal step up from mechanical units. In some applications, removable servo-type mounting tabs allows them to be mounted without hard-to-remove servo tape, and Hitec's unique silicone heat-sink boot helps protect delicate electronics as it aids cooling efficiency. Factory-installed connectors and flexible silicone insulated wires make for easy installation.



SP560

- Adjustable reverse delay (0.1 to 1 second).
- Silicone heat-sink boot for efficient cooling and FET protection.
- Removable servo-type mounting lugs.
- Manual setup with LED indicator for neutral and full throttle.



SP520 Plus

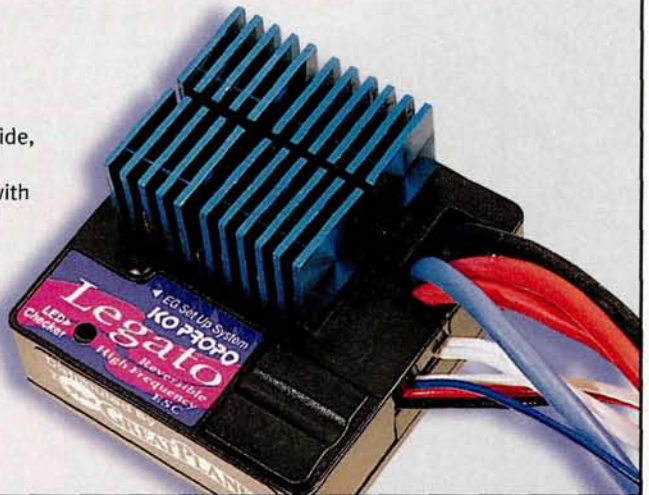
- Fixed reverse delay (0.45 second).
- Silicone heat-sink boot for efficient cooling and FET protection.
- Removable servo-type mounting lugs.
- Manual setup with LED indicator for neutral and full throttle.

KO PROPO

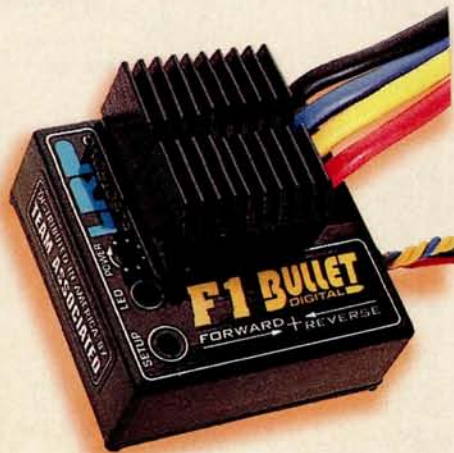
Well-known for its excellent radios but new to the ESC market (stateside, anyway), KO Propo stakes a claim with its new Legato ESC. Features include push-button setup, high-frequency operation, compatibility with modified motors of 15 or more turns, FET-servo adaptability, heat sinks and factory-installed motor and battery connectors.

LEGATO

- Simple push-button setup.
- High-frequency operation.
- Fully proportional brakes.

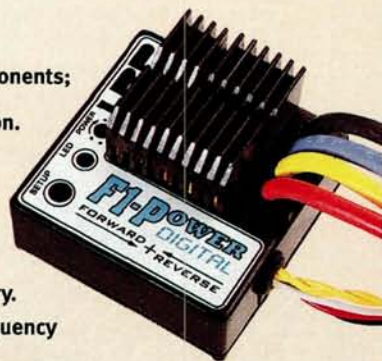


	KO PROPO	LRP				NOVAK			TEKIN	
SP520 Plus	Legato	F1 Bullet Digital	F1 Power Digital	F1 Digital	Runner Digital	Super Rooster	Rooster	610-HRV	Titan	Rebel
1.5x1.75x0.75	1.5x1.45x0.62	1.56x1.56x0.56	1.56x1.56x0.56	1.56x1.56x0.56	1.56x1.56x0.56	1.63x2.02x1.22	1.63x2.02x1.22	1.63x1.42x0.69	1.88x1.6x.056	1.8x1.4x0.56
5-7	6 & 7	4-7	4-7	4-7	4-7	6-10	6 & 7	6-10	4-10	4-10 (stock) 4-8 (mod)
0.012	NA	0.0045	0.009	0.017	0.026	0.002*	0.018*	0.0065*	0.000125	0.004
140	180	260*	170*	100*	70*	320 *	100*	120*	300	140
100A	120	120*	110*	65*	45*	160*	100*	60*	NA	NA
NA	2000	2500	2300	2100	1250	1250	1250	2500	2000	2500
6/5	6/2	5/1.6	5/1.6	5/1.6	5/1.6	6/3	5.7/0.5	5/0.5	5.0/1.0	5.0/1.0
Stock	15 turn	None	12 turn	16 turn	20 turn	None	15 turn	12 turn	None	None
Thermal	Yes	Yes/ITP	Yes/ITP	Yes/ITP	Yes/ITP	Dual-level thermal	Dual-level thermal	Thermal	Thermal	Thermal
Tamiya type	Tamiya type	Tamiya type	Tamiya type	Tamiya type	Tamiya type	None	Tamiya type	Tamiya type	None	Tamiya type
Universal	Futaba	Universal	Universal	Universal	Universal	Universal	Universal	Universal	Universal	Universal
Bullet	Bullet	Bullet	Bullet	Bullet	Bullet	None	Bullet	Bullet	Bullet	Bullet
No	No	No	No	No	No	Yes	Yes	No	Yes	Yes
1 year	1 year	90	90	90	90	120	120	120	120	120
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes/IBC	Yes/IBC	Yes/IBC	Yes/IBC	Yes	Yes	Yes	Yes	Yes
No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
\$79.95	\$129	\$175	\$132	\$99.50	\$79.95	\$210	\$129	\$165	\$205	\$129



F1 BULLET DIGITAL

- Adjustable Power Control (APC) current limiter helps inhibit wheelspin.
- Intelligent Brake Control (IBC) protects drive-train components; reverse can be engaged only after motor has come to a complete stop, then allows 5 seconds of reverse operation.
- High-frequency (2500Hz) operation for smooth throttle control.
- No motor limit.



F1 POWER DIGITAL

- Includes APC and IBC circuitry.
- Slightly lower operating frequency (2300Hz) than F1 Bullet.
- Accepts modifieds down to 12 turns.

LRP

LRP's F1 line offers three choices for the performance-minded enthusiast. All feature push-button setup, include factory-installed motor and battery connectors, operate with 4 to 7 cells and use Intelligent Temperature Protection (ITP). ITP keeps the ESC's operating temperature as cool as possible and shuts down the throttle (but not the steering) if the ESC does manage to overheat for any reason. The F1 Digital, Power and Bullet ESCs also include LRP's Intelligent Brake Control (IBC), which prevents reverse from engaging until the motor has completely stopped, and the Power and Bullet controllers add an Adjustable Power Control (APC) current limiter for enhanced control on slippery surfaces without any reduction in top speed.



RUNNER

- Economical ESC for stock and very mild (20 turns and more) modifieds.
- Easy push-button setup.
- Proportional braking and reverse.



F1 DIGITAL

- Includes IBC circuitry.
- Slightly lower operating frequency (2100Hz) than F1 Power.
- Accepts mild modifieds down to 16 turns.



610HRV

- Adjustable reverse delay (0 to 3 seconds).
- Handles up to 10 cells.
- Smooth, high-frequency (2500Hz) operation.
- Novak's smallest reversing ESC.

NOVAK ELECTRONICS

Novak leads the high-performance reversing ESC segment with its mighty Super Rooster, which can handle the hottest motors in just about any application—even dual-motor monster trucks. Now that's tough! Both the Super Rooster and its predecessor, the Rooster, feature Smart Braking circuitry that prevents reverse from kicking in until the vehicle has slowed to a transmission-friendly speed. If super-smooth throttle control is a priority for you, check out the 610-HRV. At 2500Hz, it offers Novak's highest operating frequency in a reversing ESC, and it can handle up to 10 cells.



SUPER ROOSTER

- Super tough—no motor limit, even in dual-motor applications.
- Smart Braking protects drive-train components; reverse can only be engaged once the vehicle has slowed to a safe speed.
- Polar Drive Technology for cool, efficient operation.
- Heavy-duty 6V, 3A BEC handles high-power servos.
- Accepts Novak's brake-light kit (not included—darn).
- Radio Priority Circuitry prevents loss of control at low voltage.
- Reverse can be locked out for racing.
- Connectors aren't included; soldering skills required for installation.



ROOSTER

- Smart Braking, Polar Drive circuitry, reverse disable and brake-light compatibility (lights not included) in a less expensive package.
- Handles mild modified motors.

TEKIN

Both of Tekin's tough reversing ESCs feature high-frequency operation for smooth throttle control with any motor—stock or modified. Reverse delay may be programmed for up to 4 seconds, or set with no delay for stunt-driving action. If you plan to hit the track for a race or two, reverse is easily disabled via the Quick Tune setup button. The aptly named Titan offers Tekin's highest performance in a reversing ESC with very low resistance and handy replaceable wires. These wires are great for custom installations, as you can cut them as short as you like without being concerned about installing the ESC in another vehicle later. When you're ready to put the Titan into another car, just install longer wires!



REBEL

- Massive integral heat sink for cool running.
- Reverse may be disabled for racing.
- Quick Tune setup.
- High-frequency operation (2500Hz) for cool, efficient running.

TITAN

- Tough enough to run any modified or dual modifieds with 18 turns or more.
- Adjustable reverse delay (up to 4 seconds).
- Solder posts allow easy replacement of battery and motor wires.
- Regeneration feature stores energy from motor while braking.
- High-frequency operation (2000Hz) for cool, efficient running.
- Reverse may be disabled for racing.
- Connectors aren't included; soldering skills required for installation.



FREQUENTLY ASKED QUESTIONS AND GOOD THINGS TO KNOW

I already have reverse with my mechanical speed control. What's the big deal about an ESC?

You've never driven with an ESC, have you? Thought not. An ESC has smooth throttle control, not the three herky-jerky speeds or "steps" you find with most mechanical speed controls. With an ESC, you have infinite control from stopped to full bongo. Efficiency and reliability? No contest. An ESC will extend your run time, and it's a set-and-forget it affair—no finicky linkages to adjust or resistors to burn out. Plus, you'll save a good chunk of weight when you remove that bulky mechanical control, its extra wire and the big ole servo that controlled it. Less weight equals more speed, y'know.

I'm sold. How do I know which ESC to buy?

Well, what do you need? If you plan to run more than 7 cells, hot modified motors, dual motors, or (gulp) dual hot modified motors, you'd better get something that can handle a lot of amps, or you'll suffer the consequences. Novak's Super Rooster and Tekin's Titan are the big guns of heavy-duty ESC-dom and can handle 320 and 300 amps, respectively. On the other hand, if your tastes run to mild mods and 6- or 7-cell packs, just about any ESC in this guide will suit you. Check the features lists for stuff that will be useful to you—reverse disable, current limiters, or high-frequency operation, for example—and pick whichever suits your budget, brand loyalties, or fashion sense (those purple GMs are pretty cool).

Can I race with a reversing ESC?

Depends on the track and on your ESC. On some of the units in this guide, you can disable the reverse throttle, and that leaves you with race-legal, forward-and-brake operation. Some

tracks will allow you to race with active reverse (especially in the novice and beginner classes), as long as you don't use reverse during the race to get out of trouble (that's what the corner marshals are for). Reversing ESCs do not perform as efficiently as dedicated racing units, however, so save 'em for occasional use. If you get hooked on competition, you'll want a forward-only model.

Is it hard to install an ESC?

No.

Uh, a little more help please?

Oh, sorry. Most of the ESCs in this guide are equipped with a Tamiya-type connector for the battery and bullet connectors for the motor. The typical kit motor uses bullet connectors, and most stick packs use Tamiya plugs, so ESC installation simply requires a bit of mounting tape to stick the ESC to the chassis and a few seconds to plug it into the motor and battery. You will, however, have to solder capacitors (included with the ESC) onto your motor to prevent radio "glitches" caused by motor "noise." Don't worry if that sounds as if it's beyond your skills. If you bought your ESC from a good R/C hobby shop, the people there will probably be happy to solder the capacitors for you at no charge, or they'll steer you toward an experienced person who can help.

Anything else I should know?

Isn't there always? Keep these in mind:

- Don't overuse reverse. Reverse is for backing out of trouble, doing tricks and parallel parking. It is not for running 10 laps around the track backwards! Use reverse for short periods only. The LRP and GM ESCs actually limit you to 5 or 6 seconds of reverse to prevent overheating because of extended reverse operation;

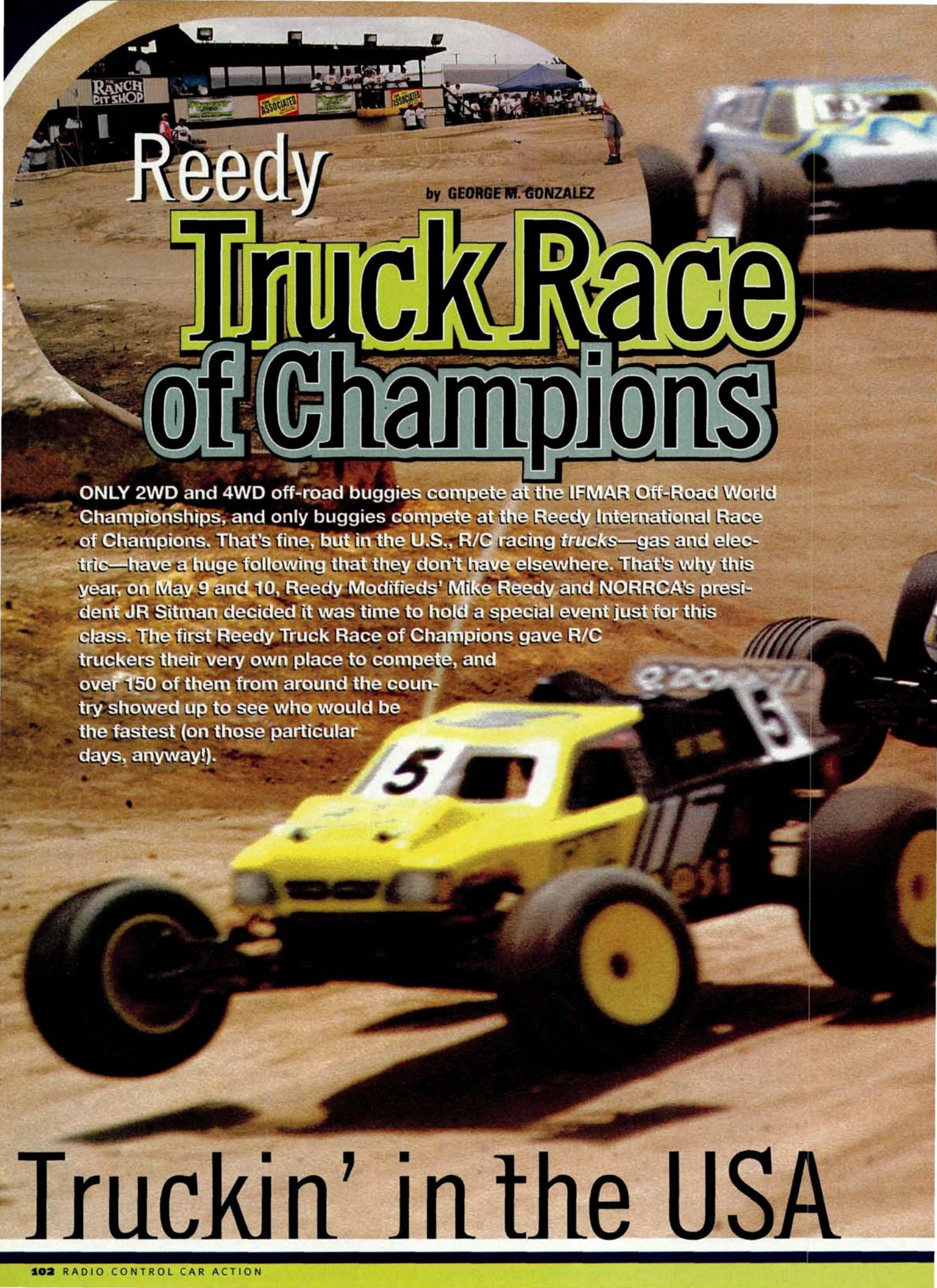
you get more reverse time after you've returned to neutral or hit forward throttle (don't worry; 5 seconds is plenty). Extended driving in reverse is also hard on the motor, especially those with lots of "timing"—stock motors, for example.

- Make sure forward is forward and reverse is reverse. If, after carefully following the installation instructions, you find that the car takes off in reverse when you pull full throttle (and vice versa), DO NOT attempt to fix the problem simply by flipping the radio's throttle-servo reversing switch. You probably have the motor hooked up backwards, or you followed the setup sequence incorrectly. Check it out and set it up right, or your motor and ESC will suffer.

- Slow down before you hit reverse. Do you stop a full-scale car by slamming it into reverse while you're still traveling at 30mph? If you answered "Yes," say "Hi" to the AAMCO guy for me. Some ESCs, such as Novak's Rooster and LRP's F1 line, have special circuitry that doesn't allow reverse to engage until the motor has stopped or reached a safe speed. On other units, there's a delay (fixed or adjustable) before reverse kicks in. Just be careful, and your gears will thank you.
- NEVER use a Schottky diode with a reversing ESC. This can damage the ESC and will absolutely toast the diode (with much heat and smoke—highly unpleasant). If you plan to use a motor that has been used in another car, check for a Schottky diode before you install it—or else! ■

Never use a Schottky diode with a reversing ESC.





Reedy

by GEORGE M. GONZALEZ

Truck Race of Champions

ONLY 2WD and 4WD off-road buggies compete at the IFMAR Off-Road World Championships, and only buggies compete at the Reedy International Race of Champions. That's fine, but in the U.S., R/C racing *trucks*—gas and electric—have a huge following that they don't have elsewhere. That's why this year, on May 9 and 10, Reedy Modifieds' Mike Reedy and NORRCA's president JR Sitman decided it was time to hold a special event just for this class. The first Reedy Truck Race of Champions gave R/C truckers their very own place to compete, and over 150 of them from around the country showed up to see who would be the fastest (on those particular days, anyway!).

Truckin' in the USA

PHOTOS BY GEORGE GONZALEZ



Fill it up and adjust the carb—an often-performed ritual during the 30-minute Expert Gas A-main.



Isn't love grand? Nick Lasley rebuilds his shocks while his girlfriend wipes a smudge off his face.



Seven-year-old Dalton Harbaugh from Anaheim, CA, was the fastest youngster at the event. He finished in first place in the Expert Modified E-main. Way to go, Dalton!



Invitational winners (left to right): Team Associated/Team Pro-Line driver Scott Hughes (third); Team Associated/Reedy drivers Mark Pavidis (second) and Lloyd Dassonville (first).

REEDY TRUCK RACE OF CHAMPIONS

WINNERS - ELECTRIC

EXPERT MOD. TRUCK A-MAIN	Fin.	Qual.	Driver	Chassis	Motor	Battery	ESC	Radio	Body	Tires (F/R)	Pinion/Spur
	1	3	Brandon Aymar	Associated	Peak	Peak	Novak	Airtronics	Associated	Pro-Line/Pro-Line	19/87
	2	1	Nick Lasley	Losi	Trinity	Trinity	Tekin	Airtronics	Losi	Losi/Pro-Line	21/88
	3	9	Greg Monise	Losi	Banzai	Trinity	Novak	Airtronics	Losi	Losi	16/88
	4	5	Matt Ganske	Associated	Reedy	Reedy	Novak	KO	Pro-Line	Pro-Line/Pro-Line	17/90
	5	8	Blade Luna	Losi	ProMatch	ProMatch	Novak	Airtronics	Losi	Losi	21/88
	6	2	Greg Degani	Associated	Fantom	Ballistic	LRP	Futaba	Associated	Pro-Line	16/87
	7	10	Shawn Blackwell	Losi	GM Racing	GM Racing	LRP	Airtronics	Losi	Losi/Pro-Line	17/88
	8	6	Andy Smolnik	Associated	Reedy	Reedy	LRP	Airtronics	Associated	Pro-Line	18/87
	9	4	Charlie Albrech	Losi	Peak	Peak	NA	Airtronics	Losi	Losi/Pro-Line	19/88
	10	7	Jeremy Aymar	Associated	Peak	Peak	LRP	Airtronics	Associated	Pro-Line	18/87
EXPERT STOCK TRUCK	Fin.	Qual.	Driver	Chassis	Motor	Battery	ESC	Radio	Body	Tires (F/R)	Pinion/Spur
	1	3	Brandon Aymar	Associated	Peak	Peak	Novak	Airtronics	Associated	Pro-Line/Pro-Line	23/87
	2	6	Ryan Maifield	Losi	Peak	Orion	Novak	Airtronics	Losi	Losi/Pro-Line	22/86
	3	2	Jeremy Aymar	Associated	Peak	Peak	LRP	Airtronics	Associated	Pro-Line	22/87
	4	9	Justin Morrison	Losi	Peak	Peak	Tekin	NA	Losi	Losi	NA
	5	1	Nick Lasley	Losi	Trinity	Trinity	Tekin	Airtronics	Losi	Losi/Pro-Line	23/88
	6	5	Eddie Bernal	Associated	Reedy	Reedy	LRP	Airtronics	Associated	Pro-Line	20/87
	7	8	Shawn Blackwell	Losi	GM	GM	LRP	Airtronics	Losi	Losi/Pro-Line	23/88
	8	10	Andy Smolnik	Associated	Reedy	Reedy	LRP	Airtronics	Associated	Pro-Line	21/87
	9	4	Mike Kendall	Losi	Fantom	Orion	Tekin	Airtronics	Losi	Losi/Pro-Line	22/88
	10	7	Josh Anderson	Losi	Maxtec	Maxtec	Novak	Airtronics	NA	Pro-Line	24/88
INVITATIONAL ELECTRIC TRUCKS	Fin.	Qual.	Driver	Chassis	Motor	Battery	ESC	Radio	Body	Tires (F/R)	Pinion/Spur
	1	1	Lloyd Dassonville	Associated	Reedy	Reedy	LRP	Airtronics	Associated	Pro-Line/Pro-Line	17/87
	2	5	Mark Pavidis	Associated	Reedy	Reedy	LRP	Airtronics	Associated	Pro-Line	18/87
	3	4	Scott Hughes	Associated	Reedy	Reedy	LRP	KO Propo	ProLine	Edge/Pro-Line	16/87
	4	7	Alex Guerrero	Losi	NA	NA	NA	NA	NA	NA	NA
	5	6	Matt Francis	Losi	Trinity	Trinity	LRP	Airtronic	Stock	Losi/Pro-Line	19/88
	6	2	Billy Easton	Associated	Reedy	Reedy	LRP	Airtronics	Associated	Pro-Line	18/87
	7	8	J.R. Mitch	Associated	Reedy	Reedy	LRP	Airtronics	Associated	Pro-Line	20/87
	8	9	Brian Dunbar	Losi	GM	GM	V12	Airtronics	Losi	Losi/Pro-Line	NA
	9	10	Rick Hohwart	Losi	Peak	Peak	Novak	Airtronics	Losi	Losi/Pro-Line	18/88
	10	3	Brian Kinwald	Losi	Trinity	Trinity	Novak	Airtronics	Losi	Losi/Pro-Line	19/87

NITRO'S HOTTEST SHOWROOM



When you want to browse around gas racing's hottest showroom, start up your internet browser. Log onto the Team Serpent Network web site and find out how the Power-Start starting box effortlessly fires up a gas car or truck. Learn why ROAR champs and the Worlds T.Q. choose Mega engines. See which Impact-2 features make it such a 1/10-scale racing force. Or discover why the Vector is simply the most advanced R/C car ever made. If you're into gas, get into TSN - Because the keys to unlock nitro's hottest showroom are at your fingertips.



WINNERS - GAS

EXPERT GAS TRUCK	Fin.	Qual.	Driver	Chassis	Body	Engine	Pipe	Fuel	Clutch bell	Radio	Tires (F/R)
	1	2	Billy Easton	Associated	Associated	O.S.	Associated	O'Donnell	15/66	Airtronics	Pro-Line
	2	6	Austin Dvorak	Associated	Pro-Line	O.S.	Associated	O'Donnell	15/66	Airtronics	Pro-Line
	3	1	Brian Kinwald	Losi	Losi	O.S.	Paris	O'Donnell	NA	Airtronics	Losi/Pro-Line
	4	10	Jimmy Jacobson	Associated	Associated	O.S.	Associated	O'Donnell	16/66	KO Propo	Pro-Line
	5	7	Mark Pavidis	Associated	Pro-Line	O.S.	Associated	O'Donnell	15/66	Airtronics	Pro-Line
	6	8	Mike Mellin	Losi	Losi	O.S.	O'Donnell	O'Donnell	19/75	Airtronics	Losi/Pro-Line
	7	3	Travis Amezcua	Associated	Associated	O.S.	Associated	O'Donnell	15/66	Airtronics	Pro-Line
	8	9	Greg Monise	Losi	Losi	O.S.	Paris	O'Donnell	18/76	Sanwa	Losi
	9	4	Matt Francis	Losi	Stock	O.S.	NA	O'Donnell	17/78	Airtronics	Losi/Pro-Line
	10	5	Bryce Beaver	Associated	Associated	O.S.	Associated	O'Donnell	15/66	Airtronics	Pro-Line

TRUCKS, TRUCKS AND MORE TRUCKS

At a special Electric Invitational, A-main finalists from 1997 NORRCA national championships and truck world cup events—the cream of the R/C racing crop—competed. In addition, we saw Expert Mod and Expert Stock electric competition and gas Sportsman and Expert.

There were three rounds of qualifying. Expert Gas lasted 5 minutes, and the other rounds were all 4 minutes; winners in each class were determined by an A-main, the lengths of which varied: Electric—4 minutes; Sportsman Gas—15 minutes; Expert Gas—30 minutes.

It was awesome to see both electric and gas trucks in this one event, even

though they didn't compete against each other; the enthusiasm both classes generated was great to see. A crowd showed up on both days, the staff at the Ranch Pit Shop (and nature) made sure they were comfortable, and the drivers ensured they saw their fair share of action.

QUALIFYING

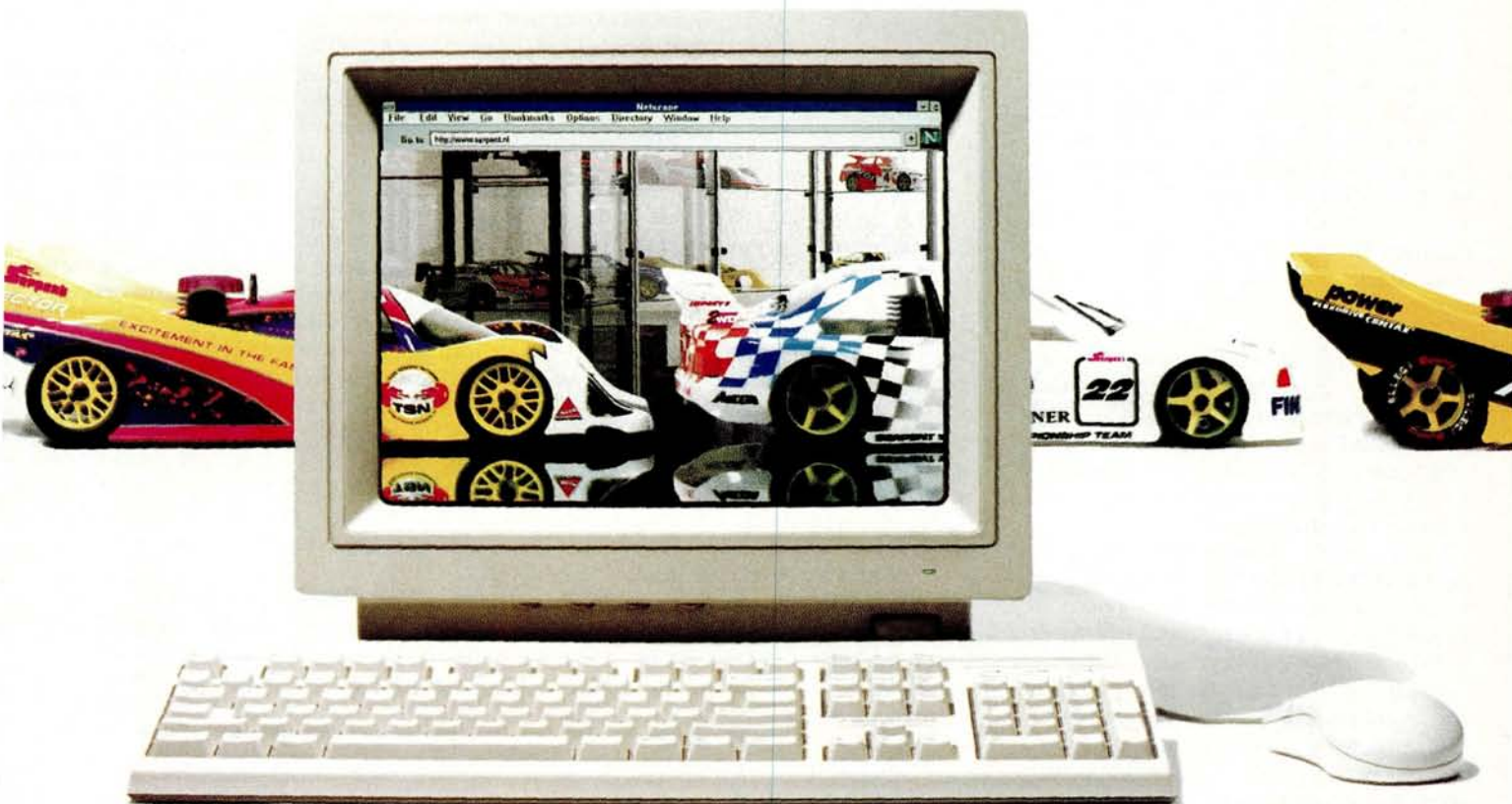
• **Expert Stock.** Team Losi/Trinity driver Nick Lasley stole the TQ in the last round after posting a fast 10/4:10.67. Jeremy Aymar and his brother Brandon ended in second and third, within 2 seconds of each other.

• **Expert Mod.** Nick Lasley stole the show in this class, too, after posting a 10/4:05.20 in the last round to take the

TQ. Interestingly enough, his TQ time in the Mod class was only 5 seconds (a half a lap) faster than his TQ time in the Stock class. No doubt, he had some serious horsepower bolted to his stock truck. Greg Degani set the TQ pace in the first round, but had to settle for the spot next to the pole when Lasley edged him out by 1/100 second.

• **Invitational.** Team Associated/Reedy driver Lloyd Dassonville surprised everyone by swiping the TQ away from Team Trinity/Team Losi driver Brian Kinwald in the third and final round. Team Associated/Reedy driver Billy Easton sneaked right in to claim the next best spot on the A-main grid, while the great "Kinwaldo" earned third place.

AND YOU'VE GOT THE KEYS.



www.serpent.nl

Serpent
EXCITEMENT IN THE FAST LANE

• **Expert Gas.** The fastest times were recorded in the third and final round. Brian Kinwald's Team Losi GTX was the fastest, but Billy Easton's Team Associated RC10GT was less than 1/100 second behind. I did a quick double take when I looked at the data sheets and noticed that Team Associated driver Travis Amezcua had posted a time that was less than 1/100 second behind Easton's best time—talk about close racing! (Lap-counting transponders were not used, so I hope the guy at the computer keyboard had a fast finger.)

A-MAIN ACTION

• **Expert Mod.** After a rocky start, TQ Lasley broke out to an early lead with Matt Ganske and Brandon Aymar close behind. Aymar soon passed Ganske to claim second, and then he started to reel in the leader. After 2 minutes, the trucks spread out, and the race was uneventful until the final few seconds. Lasley came off one of the jumps a little squirrely, and Aymar closed the gap between them. As the wind began to blow strongly, it was a battle for first. Some of the trucks were thrown onto their lids when a gust picked them up as they took a jump. With less than 30 seconds remaining, Lasley hit a cement barrier, and Aymar sneaked by to take the lead. Lasley didn't give up and fought to the very end, but Aymar took the top honors. Greg Monise rounded up the third spot.

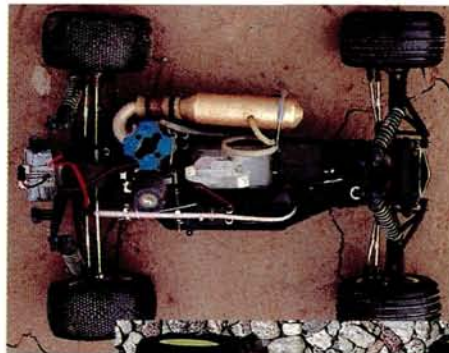
• **Expert Stock.** TQ Lasley shot out in front with the Aymar brothers, Brandon and Jeremy, right on his tail. With a minute down, Jeremy took a spill, and that allowed Ryan Maifield to claim third. They continued in this order until the 3-minute mark when Lasley got hung up on a pipe and Brandon took the lead. Lasley's misfortune cost him several positions, and he ended up in fifth. Brandon hung in there to take the win, Ryan Maifield claimed second, and Jeremy secured third.

• **Invitational.** TQ Lloyd Dasonville led for the first lap, while Team Associated/Reedy driver Mark Pavidis, Team Associated/Pro-Line driver Scott Hughes and Team Losi driver Alex Guerrero freight-trained behind him. After 1 minute, Brian Kinwald passed Guerrero and Hughes, and he was soon on Mark Pavidis's tail. Then Pavidis took a tumble that allowed Kinwald to claim second. Meanwhile, Dasonville enjoyed a half a track lead and drove cautiously because there wasn't any pressure.

With less than a minute to go, a pileup in the infield allowed third-place Pavidis and second-place Kinwald to get away from the rest of the pack and make a last-ditch effort to catch the leader. Dasonville continued to stretch his lead, however, while

the gap between Kinwald and Pavidis closed as Pavidis tailgated Kinwald through every corner and every jump. With less than 20 seconds remaining, Kinwald ran into trouble while going through traffic and ended up on his lid. The entire field passed Kinwald by, leaving him in a cloud of dust.

Dasonville crossed the line before the end-of-race buzzer sounded, and that earned him the extra 11th lap, while most of the rest had to settle for 10. Mark Pavidis secured second,



Top to bottom: Billy Easton's A-main-winning Team Associated RC10GT, Lloyd Dasonville's TQ and A-main-winning Team Associated RC10T3, and Brandon Aymar's Stock- and Mod-winning Team Associated RC10T3 (shown with Peak stock motor). **Left:** Johnny Rizzardi smoked his competition in the Sportsman Gas A-main.

while Scott Hughes took third, and Brian Kinwald, who had raced diligently, finished dead last.

• **Expert Gas.** Kinwald jumped out in front and had the honor of leading the field around the track, while TQ Billy Easton and his teammate Mark Pavidis followed dangerously close behind. A 30-minute race allowed plenty of time for strategizing, which is a luxury in R/C racing. Most of the racers planned six fuel stops, but some opted to take only five.

At around the 5-minute mark, Kinwald got tangled on a pipe, and Easton took the lead. His lead was short-lived, however, because Kinwald immediately made an aggressive pass and was back in front. After 5 minutes, Kinwald still led, and Easton and Pavidis were second and third.

At around 6 minutes, all three came in for pit stops and exited in the same order, so nobody lost ground. A few minutes later,

Kinwald was on his lid, and by the time his truck had been recovered, he was looking at fourth. Meanwhile, Easton claimed the lead,

Pavidis followed in second, and within minutes, Kinwald was back in third and reeling in Pavidis.

At around the 10-minute mark, Easton had stretched his lead to nearly half a track, and Kinwald was

harassing Pavidis by tapping his tailgate around every corner. Wow! What a race! At around the halfway point, Pavidis and Kinwald got tangled while exiting the back sweeper. Both trucks rolled several times, landed on all fours and continued as if nothing had happened. At the next corner, Kinwald came around Pavidis to claim second, but the leader—Easton—was nowhere in sight because he was close behind Kinwald and ready to lap him!

After 20 minutes, the race began to take on a new character. Easton continued to stretch his lead, but Kinwald lost ground and was in third behind Austin Dvorak. Dvorak was lurking around in fourth or fifth the entire time, just waiting to strike. Pavidis started to fall back and was soon in fifth. This is actually how the race ended, but the lap count was completely different. Easton naturally took first by finishing the race with 74 laps; Dvorak covered 72 laps to take second; and Kinwald circled the course 71 times to secure third.

FINAL THOUGHTS

The first annual Reedy Truck Race of Champions, like the International Race of Champions, was a complete success. I congratulate champions Lloyd Dasonville, Billy Easton and Brandon Aymar on their accomplishments and look forward to covering more Reedy Truck races in the future. See you at the races.

GET UP TO SPEED WITH ...

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Since arriving on the racing scene several years ago, Maxtec motors and batteries have won some prestigious championships and have been chosen by top drivers such as Greg Hodapp, Barry Baker and Brent Wallace. Most recently, new made-in-USA motor technology has evolved within this small company, and racers are suddenly screaming "Buy American!" Maxtec's co-owner, Joe Maloney, has been instrumental in bringing this new motor technology from concept to reality, and he just happens to be this month's "Innovator at Work."

In racing circles, Peak Performance/Team Losi factory driver Jimmy Babcock is one of the rising stars; he has won 11 ROAR and NORRCA national championships.

Jimmy is the current subject of our "Racer Profile" section; get to know him!

There's more; in "Speed Shop," you'll find out about those secret Street Weapon tuning parts from Team Losi that have caused quite a stir wherever they've been raced. After months of testing, the performance-enhancing parts are available and ready to dial in your Street Weapon with style. You'll also find some cool new goodies from MIP, HPI and Team Losi in the newest chapter of "Speed Shop," and as a bonus, we've added our event coverage of the IFMAR Electric On-Road Worlds Warm-up, direct from Hawks R/C Raceway in Antioch, CA.

Joe Maloney

INNOVATOR AT WORK

Many consider Maxtec's Joe Maloney one of the gurus of electric-motor technology. But where did Joe get all his training? Why did Maxtec decide to manufacture a 100-percent American-made motor when there are so many excellent motor manufacturers overseas? These are just a couple of the questions we asked Joe in this interview, conducted at So Cal Raceway in Huntington Beach, CA—one of Joe's hangouts.

R/C Car Action: When and how did you first become involved in R/C racing?

Joe Maloney: I have always loved R/C cars. As far back as I can remember, I always had some low-cost, toy R/C car to play around with. I didn't get my first real racecar until I was 13, though.

RCCA: You're a very talented motor builder and designer; when did you first discover you had a knack for electric-motor tuning and design?

JM: I come from a family of designers and artists. My mother is a successful clothing designer, my father is an architect, my grandfather was a graphic designer, and his brother was a composer of classical music. I guess I'm lucky to have this kind of background and upbringing, and I think it has made me a more creative person.

Because of my natural creativity and curiosity, I have been tearing down electric motors from day one. I soon found myself buried in motor-theory books and began studying the properties of alloys and the results when exposed to electromagnetic fields. To answer your question more specifically, I don't think I discovered that I had a knack for motor tuning; it's more of an obsession.

RCCA: You kind of remind me of that mad scientist from the movie "Back to the Future"! So tell me, Joe, why did you decide to start

Maxtec, and why did you decide to sell motors when there is already a ton of competition in that area?

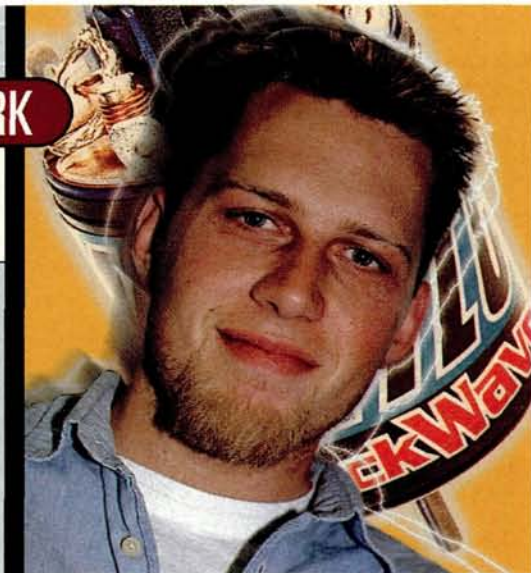
JM: It was around the time when I started school to get a business degree, and I decided to start a small business and sell tuned motors. Maxtec was born, and although the company was successful, it was mainly funded by money that I earned doing graphic design work on the side. It didn't take long for me to discover that in order for the company to succeed, I would need help. That's when I met Suparat Uahwatanasakul in the summer of '94 at a race in Southern California. Shortly after, we became partners. Since then, Suparat has become the company president, while I am the vice president. This arrangement allows me the time to dedicate my efforts to developing new products and traveling to races all around the world with our team drivers.

RCCA: Tell me about your hot, new ShockWave modified and AfterShock stock motors; why did Maxtec decide to "reinvent the wheel," so to speak, by creating electric-motor technology?

JM: After tuning motors for a few years and winning some prestigious races, I felt that I had reached a point where I could only take the current technology so far. I was reaching for the next level; another way to get more power out

of a motor. One evening, while working late at the factory, I came up with the heart of the ShockWave and AfterShock motors—the reverse taper armature. After making the prototypes and testing them, we knew we had what we were looking for.

Then a slight marketing problem arose; we couldn't just sell the armatures alone. As a result, I spent the next year and a half—'95 to '96—designing the ShockWave. We went through every part of the motor: motor can, endbell, brush hoods, etc., to find ways to improve what was on the market. Although we had the opportunity to manufacture the motor overseas, we felt that we would be able to use superior materials and work more closely with our suppliers if we kept it all in the U.S. In our opinion, by eliminating the middleman [overseas motor manufacturers], we could spend



Continued from previous page

INNOVATOR AT WORK

the savings on some fairly exotic materials. Besides, we didn't want to rely on suppliers who were on the other side of the world.

RCCA: Interesting. Maxtec motors are in the winners' circle at just about every major R/C racing event; what's the secret of your success?

JM: I think Maxtec's success can be attributed to hard work and dedication. The environment here is one that allows everyone to be innovative. We push each other very hard, and in my opinion, we work longer hours here than at any other company. We also have competitive natures, both at the track and on the job.

RCCA: Maxtec also manufactures other R/C products; what are some of the company's other hot sellers?

JM: I've been very happy with our battery department here at Maxtec. We held off on entering the battery market until we felt we could offer an advantage, and that advantage came in the form of our very own voltage-increasing system. Because it was designed and built in-house, it is constantly being refined to produce the best possible results. We also use LAVco matchers because of their accuracy and their superior results. In addition, all of the matching is done by a dedicated department at Maxtec under strict temperature control. Both racing results and consumer acceptance lead us to believe that our efforts have paid off.

RCCA: I've noticed that you're also kind of a full-scale car buff; at least, I always see you driving hot-looking Ford Mustang GTs. Are full-size cars a passion of yours?

JM: Absolutely! I love horsepower! What epitomizes American-made horsepower more than a Mustang? It makes driving all over Southern California just as much fun as attending R/C races.

RCCA: What are some of your other interests? Hobbies, sports, etc.?



Here's Joe "modeling" Maxtec's Shockwave and Aftershock motors.

JM: I try to work out three or four times a week to balance out my busy work schedule. Keeping in shape helps me stay creative and mentally sharp. I also love to go to clubs and dance; it's a great way to let go on the weekends.

RCCA: What are some of your goals, both personal and in business?

JM: Now that the AfterShock motor is finished, my most important goal is to get a master's degree in business. Education should be everyone's major goal. As far as Maxtec is concerned, I could not be more happy about how far we have come and how fast we have continued to grow. Our goal at Maxtec is not to sell the most motors; just the best ones.

RCCA: What can we expect from Maxtec in the near future?

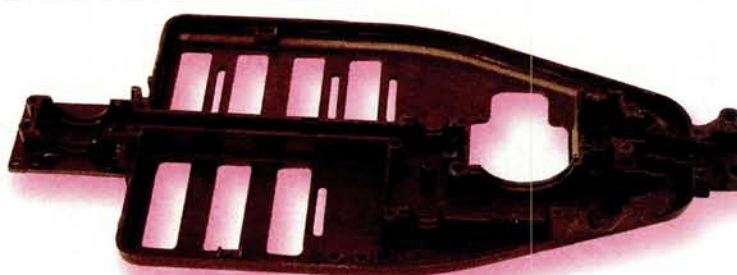
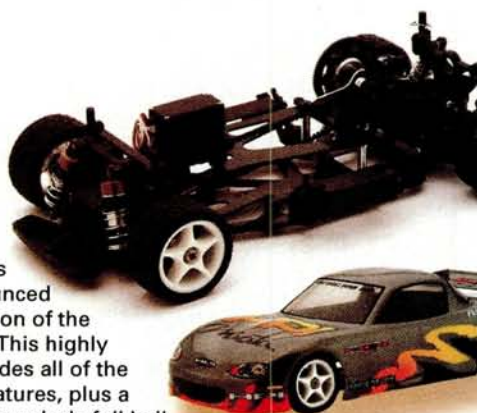
JM: The R/C industry has only caught a glimpse of what we have to offer. We will soon begin implementing some more radical designs with every new motor we release. It is also a goal of ours to increase the life expectancy and consistency of the motor. This will help lower the cost to the consumer, while making us more competitive. We also plan to release a new line of Maxtec R/C car Lexan bodies and have secured the services of a top body sculptor from the full-scale car industry. That's all I can say for now, but keep your eye out for bodies carrying a Maxtec header card.

RCCA: Joe, thanks for your time and insights. I'm sure I'll see you at the next big race!

Speed Shop

HPI RS4 Mini goes Pro

Check it out: it's HPI's* new RS4 Mini Pro. That's right; HPI has just announced it will release a pro version of the popular 4WD RS4 Mini. This highly anticipated release includes all of the RS4 Mini's hot racing features, plus a graphite chassis and upper deck, full ball bearings, front and rear universal drive shafts, hard-anodized shocks with Teflon shock pistons and silicone oil, adjustable ball diffs, adjustable rear camber links and a belt tensioner; wow!—an impressive list of features, indeed. That's not all; the Mini Pro will come equipped with new Mini X-Pattern Radials in HPI's super-soft Pro-Compound and an incredibly hot-looking Mazda Miata MX-5 body. Part no. 296; \$369.



Team Losi's top-secret Street Weapon suspension-enhancing parts are now available!

After months of prototyping and testing, Team Losi* has just released several handling-enhancing parts for the national-championship-winning Street Weapon touring car. First on the list are its 0-degree, aluminum, front lower bulkhead and 3-degree caster blocks (sold separately). The original bulkhead provides 10 degrees of negative caster, and when combined with the stock 10-degree caster blocks, the car yields a total of 20 degrees negative caster. This setup works great on open and dusty parking-lot tracks, but on tight, high-bite tracks, the car benefits from a reduction in front caster. By combining the new bulkhead with the stock caster blocks, the car will yield a total of 10 degrees negative caster. If you want less caster, install the optional 3-degree caster blocks; the car will end up with 3 degrees negative caster.

Want to reduce the rotating mass while increasing the efficiency of your Street Weapon? Well, Losi has a few items to achieve that. Its aluminum main shaft and aluminum layshaft (sold separately) are much lighter than the stock pieces, and when they're installed will give the



New 1/8-scale goodies from MIP

MIP* was a pioneer of aluminum, hard-anodized, Teflon-coated shock-body technology, and it now offers hard-coated shock bodies for the 1/8-scale Kyosho MP-5 and Mugen Super Athlete. Its Hard Body Shocks are made of machined, high-grade aluminum and are hard-anodized in black, then coated with Teflon to reduce friction and wear from the shock pistons. The bodies are sold in pairs and include matching shock caps, mounting balls and stainless-steel hardware.

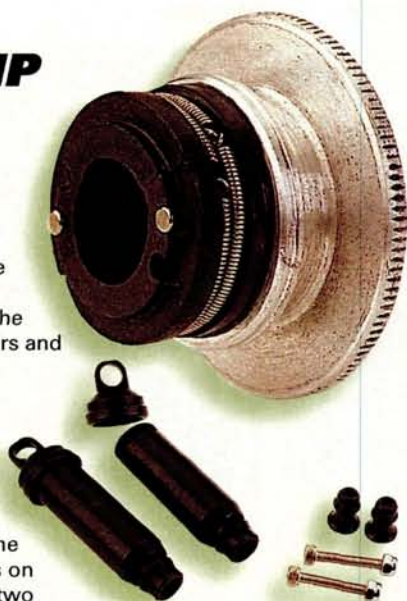
Also new from MIP is its 1/8-scale Performance Clutch System for the Mugen Athlete and Kyosho MP-5. This clutch is the result of many years of gas off-road racing experience, and now, racers can own one of the most consistent, reliable clutch systems on the market. The clutch system features two large clutch shoes made of MIP's high-grade composite material, and the clutch-shoe springs use MIP's custom extension-spring technology. A special, lightweight, aluminum flywheel is also included with each clutch kit, so if you've been looking for a smooth, consistent power transfer every time, look no farther.

■ Hard Body Shock kit

For Kyosho: part nos. 1254 (front), 1258 (rear); for Mugen: part nos. 1256 (front), 1259 (rear); \$55.

■ Performance Clutch Kit

Part nos. 1255 (Kyosho); 1257 (Mugen); \$45.



car a noticeable increase in acceleration and out-of-the-corner punch. The shafts are also hard-coated for extreme strength. Losi's new extra heavy-duty rear belt is stronger, more flexible and more efficient than the stock rear belt. According to Gil Losi Jr., just adding the new belt will make the car accelerate faster and will yield higher top speeds. Furthermore, an extra heavy-duty rear belt is available for the Double-X 4 buggy, as well.

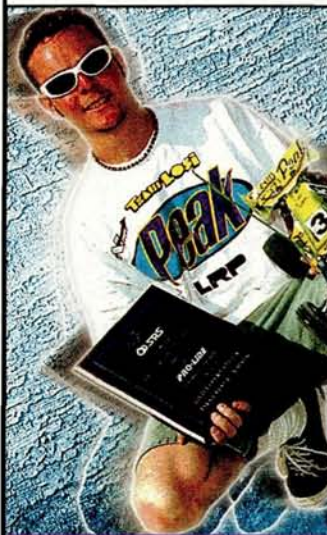
The last item—and probably the most eagerly anticipated—is the machined graphite chassis. This is just like the chassis that Joel Johnson used to win the ROAR Carpet Nationals and IFMAR Worlds Warm-up. It's molded of Losi's graphite composite and features seven machined battery slots cut out on the chassis that allow the battery pack to be placed lower on the chassis, thereby lowering the center of gravity (CG). In addition, you can move the cells forward or backward on the left side of the chassis to adjust weight distribution. The chassis also has a cut-out section directly below the motor, and the chassis will be available with or without the required special motor mount that will allow you to place the motor lower on the chassis to take advantage of the cut-out design. Consider these items "must-haves"; they'll dramatically improve the car's short, high-bite track handling.

Part nos. A9730 (0-degree aluminum front bulkhead), A9732 (3-degree front caster blocks), prices—NA; A9936 (aluminum main shaft), A3204 (extra heavy-duty, 336mm rear belt), \$10; A9934 (aluminum layshaft), \$7.50; A9917 (machined graphite chassis), \$66.95. Note: part no. A9917 requires use of additional part no. 3226 (covered motor plate), \$7.



RACER PROFILE

JIMMY BABCOCK



Jimmy Babcock is one of the rising stars of R/C racing. With 11 national championships under his belt, though, I have to say that he has already risen pretty far. Besides being an accomplished R/C racer, he's also in the electric-motor-tuning industry and works for Peak Performance under the tutelage of owner Rick Hohwart. Many Peak Performance Nightmare Stock II motors have been tuned by the hands of Jimmy Babcock. Here's your chance to find out a little more about Jimmy—the man behind the Nightmare Stock II.

VITAL SIGNS

Age: 23

Sponsors: Peak Performance, Peak Power Flow Cells, Team Losi, LRP, Airtronics, Lunsford, Kimbrough, MIP, Hot Rod Hobbies, Camsight Racing, Performance Plus and N-Style

Years racing: 6.5

Favorite racing class: off-road (2WD mod)

Occupation: R&D and production for Peak Performance

Hometown: Sylmar, CA

First R/C car: Associated RC10

Favorite track: Intermountain R/C (Utah)

Major victories: 11-time ROAR and NORRCA national champion

R/C Car Action: First, Jimmy, thanks for this opportunity to chat with you. You're one of the new kids on the block as far as the R/C racing scene goes, but your name has been appearing a lot on the A-main rosters at some of the big racing events lately. To what do you attribute your recent success?

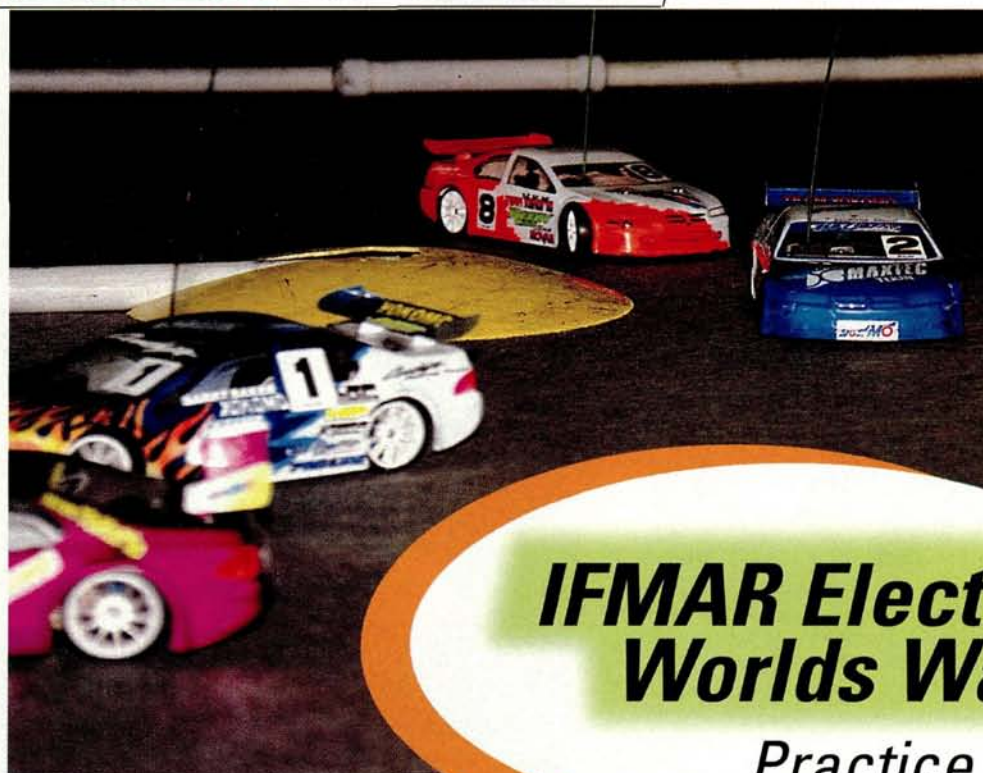
Jimmy Babcock: My dedication to the hobby. Since just about everything I do revolves around R/C racing, it's kind of hard not to learn more and become more skilled as time goes on. Also, being given the opportunity to go to most of the races helps out a lot because it allows me to both test and race against the best drivers in the world. I'm very lucky to have a job in the R/C industry, and I'm lucky that I have a boss who lets me attend all the races so I can gradually become a better driver.

RCRA: You're very modest, Jimmy; after all, you are a multinational champion. So, what was your first R/C experience?

JB: I didn't even know what an R/C car was until the day I saw one in the back of my friend Keith's car while we were at school. I was very curious, so he invited me to watch him race that very night at Fast Lane, now called Hot Rod Hobbies. After watching him race, I was hooked. I eventually got my own car and started racing all the time.

RCRA: When did you decide to become more involved in

Continued on page 116



IFMAR Electric On-Road Worlds Warm-up

Practice makes perfect

QUALIFYING AND MAIN EVENT OVERVIEW

• **Modified Sedan.** This class drew the most contestants; not surprising, considering that the IFMAR International Scale Touring Car (ISTC) World Cup event that will be held at the Electric On-Road Worlds is, by far, the most popular racing class. Just for the heck of it, a Sedan Stock class was added and turned out to be the second most-popular class. Unfortunately, the $\frac{1}{12}$ - and $\frac{1}{10}$ -scale classes were not as popular at the Warm-up, which was unusual because it was one of the last chances to compete in 8-minute heats with 6-cell, $\frac{1}{12}$ -scale pan cars on carpet.

• **Pan car.** After the four qualifiers had been run, Masami Hirosaka ended up TQ'ing both the $\frac{1}{12}$ - and $\frac{1}{10}$ -scale classes, even though he was driving a Yokomo vehicle in $\frac{1}{10}$ and an Associated vehicle in $\frac{1}{12}$. Masami repeated his performance in the triple A-mains to win the race. Mike Swauger and Team Associated/Reedy driver Jimmy Jacobson were the only drivers who gave Masami a run for his money in the $\frac{1}{10}$ -scale class, and BSR/Team Associated driver Tony Neisinger was Masami's only competitor in $\frac{1}{12}$ scale.

On-road racers had a rare opportunity to get in a few more practice laps on carpet at the IFMAR Electric On-Road Worlds Warm-up race at Hawks R/C Raceway in Antioch, CA. Although the turnout was light, the racing action was fierce, and many of the world's best on-road drivers, such as Team Trinity/Team Losi factory driver Joel Johnson and Team Maxtec/Yokomo drivers Barry Baker and Greg Hodapp, were in attendance. Of course, reigning $\frac{1}{10}$ - and $\frac{1}{12}$ -scale world champions Mike Swauger and Masami Hirosaka (both Team Yokomo/Team Associated drivers) were also present and had a chance to see just how dialed their competition really was. These guys were in for a big surprise!

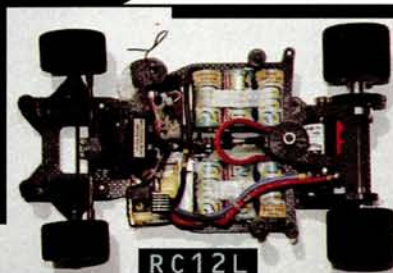
• **Touring.** As mentioned earlier, Sedan Mod was the most popular class at the event, and enough drivers competed to fill nearly three heats. This is still an incredibly low body count, considering the popularity of touring cars. Masami Hirosaka set the TQ pace early on, and his score held up until Joel Johnson stole it from him in the last round of qualifying. A rule requiring the use of controlled (regulated) tires was obviously not enforced at this event. Joel used the regulated tires until the last qualifier, when he decided to switch to Losi tires because nobody else was using the special, regulated tires. As a result, he set a new TQ.

A-MAIN WINNING CARS



YRX-10

Masami's Warm-up-winning Yokomo YRX-10. An unusual car, but boy, can this thing fly!



RC12L

Masami Hirosaka's top qualifying, race-winning Team Associated RC12L.



STREET WEAPON

Joel Johnson's top-qualifying and race-winning Team Losi Street Weapon; this car was dialed!

The Andy's Difference



Bodies, bodies everywhere Andy Jacobson poses with his very popular shells. A prolific painter and designer, Andy's bodies were the popular choice at the Worlds Warm-up.

There's usually a pretty good assortment of bodies represented at a typical touring-car race, but at the Worlds Warm-up just about every driver in the Sedan Modified A-main had an Andy's Stratus body covering his high-performance, touring-car chassis. If you haven't already heard, the Andy's Stratus body is the number-one body in touring-car racing, and the reason for its success is simple: it provides the perfect blend of downforce and front traction necessary for competitive 4WD touring-car racing. It was interesting to see Masami's trademark pink and green paint scheme on an American body for a change.

Of course, all the A-main drivers had their Stratus bodies decked out with their own team colors, but in my opinion, Mike Swauger's Yokomo was the best-looking car in the place. I think company owner Andy Jacobson felt that way too, because he's holding Swauger's car in the photo. Andy's Saber Mercedes Benz was also a very popular choice in the 1/12- and 1/10-scale pan-car classes.

None of the other racers even came close to Joel Johnson during the Mains. In the A1- and A2-mains, Joel shot out in front and never looked back, easily winning both events. Interestingly, Joel's car was noticeably faster than all the others, yet he had enough battery power after each 5-minute heat to turn in several more blistering laps. There's no doubt that Joel Johnson is back in top form, but most important, it appears that the Team Losi Street Weapon is in top form, too!

FINAL THOUGHTS

Although the turnout at the IFMAR Worlds Warm-up was rather poor, it gave a few smart drivers a rare opportunity to race one another under controlled conditions. Most of the professional drivers who were there usually compete in other forms of R/C racing, and this doesn't leave them much time to practice on-road carpet racing. We salute Joel Johnson and Masami Hirosaka for their fantastic performances and give a big "thumbs up" to all the drivers who attended. Oh, and let me add my thanks to Yokomo, Reedy, Team Associated, Tekin, Maxtec and Andy's for their generous sponsorship. See you at the races.

—G-Man



Barry Baker in heavy concentration mode. I've never seen Barry without a smile before.

Tony Neisinger readies one of his cars before the Mains.

Mike Swauger was looking good but might need a little more practice before the Worlds.

Masami Hirosaka's Pops always come along for the ride. When he's not wrenching, he's usually sleeping.

The ever-popular Joel Johnson; no doubt one of the most successful drivers ever to hold a transmitter in his hands.

1998 ON-ROAD IFMAR WORLD WARM-UPS

1/12 Modified GTP—A-main

FIN.	QUAL.	DRIVER	CHASSIS	MOTOR	BATTERY	ESC	RADIO	BODY	TIRES (F/R)	TRACTION ADDITIVE	PINION/SPUR
1	1	Masami Hirosaka	Associated	Reedy	Yokomo	Tekin	KO Propo	Protoform	Jaco	Paragon	NA
2	2	Tony Neisinger	Associated	Reedy	Reedy	Tekin	Airtronics	Andy's	BSR	BSR	NA
3	3	Jim Bishop	Trinity	Trek	Perfect Match	Novak	Airtronics	Andy's	Jaco	Paragon	NA

1/10 Modified Sedan—A-main

1	1	Joel Johnson	Losi	Trinity	Trinity	Novak	Airtronics	Andy's	Losi	Zip Grip	22/82
2	7	Barry Baker	Yokomo	Maxtec	Maxtec	LRP	Airtronics	Andy's	M1 Worlds	Paragon	23/84
3	2	Masami Hirosaka	Yokomo	Reedy	Yokomo	Tekin	KO Propo	Andy's	Yokomo	Paragon	NA

1/10 Modified GTP—A-main

1	1	Masami Hirosaka	Yokomo	Reedy	Yokomo	Tekin	KO Propo	Andy's	Jaco	Paragon	NA
2	3	Mike Swauger	Yokomo	Reedy	Reedy	LRP	Airtronics	Andy's	Jaco	Paragon	22/116
3	4	Jimmy Jacobson	Associated	Reedy	Reedy	LRP	KO Propo	Andy's	Jaco	Paragon	22/116

Stock Sedan—A-main

1	1	Joey Medeiros	Yokomo	Trek	Reedy	LRP	Airtronics	Andy's	Yokomo	Paragon	34/100
2	2	Herman Ip	HPI	Trinity	Perfect Match	Mtroniks	Airtronics	Andy's	Yokomo	NA	31/90
3	4	Mark Dayton	Yokomo	Trek	Reedy	LRP	Airtronics	Andy's	Yokomo	Paragon	33/104

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Tucson, AZ	(520) 882-8888
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RACER news

Continued from page 113

the hobby and actually seek sponsorship?

JB: From my first experience at the track, I knew that I would enjoy R/C racing for many years to come. I remember watching the fast sponsored guys like Mike Weed and Jon Anderson and saying, "One day, I'll be that fast." Sponsorship was all I dreamed about. I thought it would be the coolest thing to be sponsored, so I worked and practiced hard, and it finally paid off—with help from Jack Johnson of Team Losi.

RCCA: Cool! Is there anyone—any R/C racer—who helped you get started in racing, or who has continued helping you develop your driving skills?

JB: Well, besides my friend Keith, who got me started, without the help of guys like Mike Weed, Barry Hedrick from B&R Motorworks and Reese Dennis from Tomahawk Motors, I would definitely not be where I am today. They took the time to sponsor me when I was just an average racer. Today, I give credit to my present sponsors because without them, I wouldn't be racing. My boss, Rick Hohwart, is also very knowledgeable and helps me out a lot.

RCCA: In your opinion, who is the best off-road driver in the world?

JB: As far as off-road goes, I would have to go with the obvious: Brian Kinwald's resume speaks for itself. He can do some amazing things with an R/C car. It's incredible to watch him race his cars and trucks around the track, but it's even more thrilling to be racing right alongside him. There are many other drivers who are right up there with Brian and who, on any given day, can win major racing events. Guys like Scott Brown, Matt Francis, Greg Hodapp, Brian Dunbar and Rick Hohwart never cease to amaze me.

RCCA: What are some of your responsibilities at Peak Performance?

JB: Pretty much everyone does a little of everything around here. I do the majority of all the stock motors because I enjoy making fast stock power. I usually do most of the dyno'ing and stock motor tuning. I also do a lot of comm cutting and assembly work on the modifieds. Rick even lets me wind every now and then. The best part about Peak is that we're all a team. Rick, Joe, Derek, Marilyn and I all have a common goal: to produce the best possible motors and have fun in the process.

RCCA: Sounds as if you have it made. Tell me, what do you like best about being a team driver, and on that same note, is there anything you

don't like about it?

JB: Wow! This is an easy question. The absolute best part about being a team driver is getting to go all over the world with your friends to race R/C cars. Also, throughout my travels, I get the opportunity to meet some of the best people. I enjoy helping people, and I love when racers approach me with questions. Sometimes, it's hard to always have to say the right thing, but I've learned to deal with it.

RCCA: You definitely have a great attitude, Jimmy. I noticed that you predominantly race off-road; is on-road racing in your future?

JB: Right now my focus is on off-road racing, but I would love to do more on-road racing in the future. With such a busy off-road schedule, it's hard to find the time. I do, however, have a Team Losi Street Weapon that I've been playing around with. Now, if only I could drive like Joel Johnson, I'd be set.

RCCA: What are some of your favorite pastimes or activities, other than racing?

JB: I love NASCAR racing! I help my best friend, Gerrit Cramisight, on his full-size racecar. With all the R/C racing, it's hard to find time for R&R, but when there is time, I like to hang out with my family and friends. I enjoy going to concerts and to the occasional club or two every now and then. Hanging out with my second family, Rene and Jesse, is very important to me because they have done more for me than is imaginable, and without them, I don't know where I would be.

RCCA: Any words of wisdom you can pass along to readers who are just getting started?

JB: Two words: have fun! If you're not having fun, you shouldn't be at the track. Also, never give up. If you're having a bad race, learn from it and move on. There will always be another race. Don't get frustrated; if your car doesn't work, keep trying different things until it does. If all else fails, seek out the fast guy for advice. We are all in this hobby to have fun. If I wasn't having fun, I would not be racing.

RCCA: Thanks a lot for your time, Jimmy; good luck with your racing and your career with Peak.

JB: No—thank you, G-Man. I really appreciate being in "Racer News." It's guys like you—and magazines like R/C Car Action—that make it fun to be an R/C racer.

RCCA: Thanks again, Jimmy. See you at the races.

RACER TIP OF THE MONTH

Kirby Hand
Team Trinity factory driver

The position in which you mount the body on an oval car dramatically influences how the car will handle. Normally, you mount the body so the front tires are even with the front wheel wells that are scribed on the body. If you find you need a little more front traction, mount the body slightly more forward before you cut out the wheel wells. This will provide more downforce, which in turn will provide more front traction. The opposite applies as well; if you need a little more rear bite, mount the body on the chassis slightly more rearward; again, do this before you cut out the wheel wells, or your car will look out of scale. This tip applies to on-road racing too.

*Addresses are listed alphabetically in the Index of Manufacturers on page 209. ■

by Greg Vogel

Airbrush Basics



Learn to use this essential finishing tool

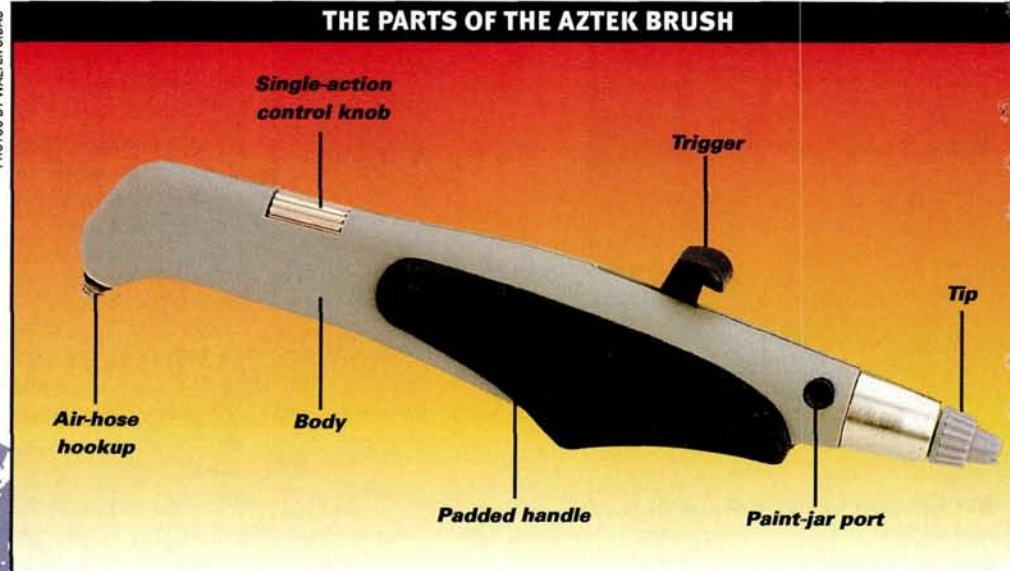
NO MATTER HOW trick (or, for that matter, how hack) your chassis is, your car's looks will be determined by its body. There are always guys with plain white shells on every car in their R/C paddock, but most of us strive to produce the best-looking paint jobs we can—some of us with more success than others. The best finishes are achieved by folks with airbrushes and the know-how to use them. If you would like to be one of those enlightened people, this article is for you. I'll go through the functions of a typical airbrush and a few simple painting procedures. With these basics (and some time and practice), you'll soon be able to paint your own show-quality shells.



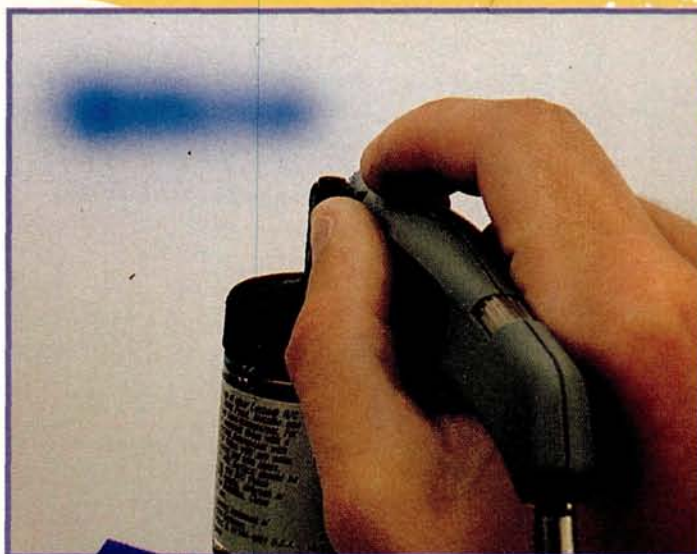
■ **Above: top**—the proper way to operate an airbrush. Hold the body as shown with one finger on the trigger. The paint cup or jar can go on either side of the brush; just remember to plug the opposite side with the stopper pin. ■ **Center**—pushing down on the trigger regulates the flow of air through the brush. As more air is pushed through the brush, more paint is siphoned and sprayed. ■ **Bottom**—when the trigger is pulled back, the amount of paint sprayed increases. These simple positions aren't the only ones you can use; there are infinite possibilities with air, paint and tip changes.

PHOTOS BY WALTER SIDAS

THE PARTS OF THE AZTEK BRUSH



Testors'® airbrush compressor (far left, part no. 8883) puts out enough pressure to do the fine detail work. Large areas, however, should be covered with paint from a spray can. The Aztek® airbrush kit (left, A470) includes a dual-action airbrush, wooden case, all four tips, all painting cups, jars, a tip-tightening tool and an air-can adapter. The hose on the right is included with the airbrush.



Now that we understand the simple actions of the airbrush, we are ready to paint. Practice by using food coloring and water on paper. This will give you an idea of how the trigger controls the air and paint. Here I used Pactra paint on paper. Start by spraying lines with the trigger set at various angles.



Here's the final product—not too bad for a quick paint job. This entire process took just two and a half hours! Don't be disappointed if it takes you longer. Practice!

WHAT IS AN AIRBRUSH?

The airbrush is a very simple tool. Air flows through a tube to the airbrush from an air source such as an air compressor or bottled air can. The pressurized air is regulated by pushing down on the airbrush trigger. This regulated flow of air passes through the airbrush body and is routed over a port that leads to an attached paint jar. The flow of air siphons the paint from the jar into a paint chamber where the air mixes with the paint and sprays it out of the airbrush tip.

There are several types of airbrush, but the two most common are the siphon-fed single-action and the more complex dual-action airbrushes.

- Single-action: regulates the flow of air and paint with one button.
- Dual-action: controls the paint and air flows independently: pull back on the

button (to control paint flow), and push down on the button (to control airflow). The dual-action brush is more versatile, as it allows a broader range of spray patterns without your having to change tips.

Changing the tips on either type affects the spray pattern. Tips range from extra fine to heavy. An extra-fine tip sprays a line of paint the width of a pencil point, while a heavy tip will spray a wide area—great for covering large sections.

The regulation of air also affects spraying results. Lower pressure allows very fine details, but the paint must be very thin, or it won't be siphoned by the low-pressure airflow. Higher pressure allows you to use more paint or thicker paint. I normally spray at around 20 pounds per square inch (psi) and never go over 30psi. When you go too high, the flow

Here are four lines made with a medium tip. Try to spray even lines; the dark areas were caused by my holding the brush too long in one spot.

How far you hold the brush away from the paper also determines the width of the spray area (illustrated by the three dots on the left). The dot on the far right shows what happens when you hold the brush too long in one place: you get a messy, runny blob of paint. The expanding line under the dots is a good practice technique that will help you master good trigger control.

of air can dry the paint as it leaves the brush (which prevents the paint from adhering to the body) or blast too much paint onto the surface.

DON'T FORGET

Practice, practice, practice! You can't master an airbrush and become a pro painter overnight. It takes dozens of bodies and hundreds of hours of painting to become a pro. The tips in this article should reduce the time it now takes you to achieve that trick paint job and should help you enhance those bodies that would otherwise sport only a single-color paint scheme.

Cleaning your airbrush

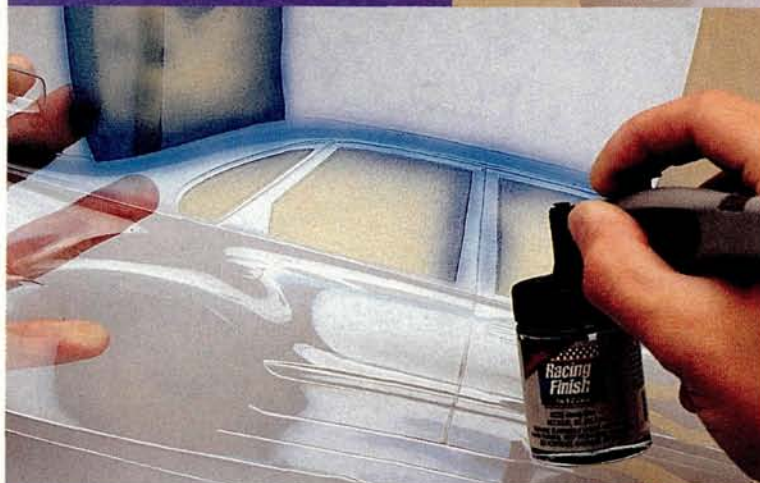
You have just finished your Lexan masterpiece, and now you're ready to relax and admire your work, right? Wrong! Before you kick back, give your airbrush a thorough cleaning. Between colors, spray a thinner through the brush to clean out the previous color. When you're done for the day, spray a half to a full bottle of cleaner through the brush. (I recommend that you buy large jars of thinner to save money.)

When the jar is empty, remove the needle assembly and drop it into a small jar of thinner to soak. Soaking will break away any leftover pigments that may be clinging to the internal parts. Then take a cotton swab, remove most of the cotton, dip it into the thinner and slide it through the jar port. A tool that acts as a tip tightener doubles as a reamer to remove any pigments caught in the body. When everything has soaked for a few hours, hook up the brush, and spray out the remaining thinner.

It takes a while to master an airbrush; I still learn something new every time I pick up mine. When you think you're ready, you might want to practice with R/C paint on a 2-liter soft-drink bottle, as the paint consistency and adhesion are different on plastic than on the absorbent paper and water. Once you feel comfortable with the results, try it on a body.



▲ I picked up a Parma* Nissan Primera body to illustrate a few simple painting techniques. In this photo, I am highlighting the body roof line with Candy Blue. I used a medium tip, pulled back and pushed down slightly on the trigger and followed the roof line. I made a few passes about 4 to 5 inches from the body to get a dark line that faded off. To prevent the paint from running, I waited a minute to two to allow drying time between each pass.



▲ Next, I highlighted the window areas and the "flames" using a similar technique. I used the fine tip and sprayed the paint so half was on the masking tape and half on the body. This makes the flames look as if they are on a higher plane than the main body color and gives a cool accent to the windows. Then, I sprayed the main area of the body with Pactra* Blue Streak from a spray can. You can cover large areas with an airbrush, but it's easier with a can; an airbrush can leave dark spotted areas where too much paint has been applied.



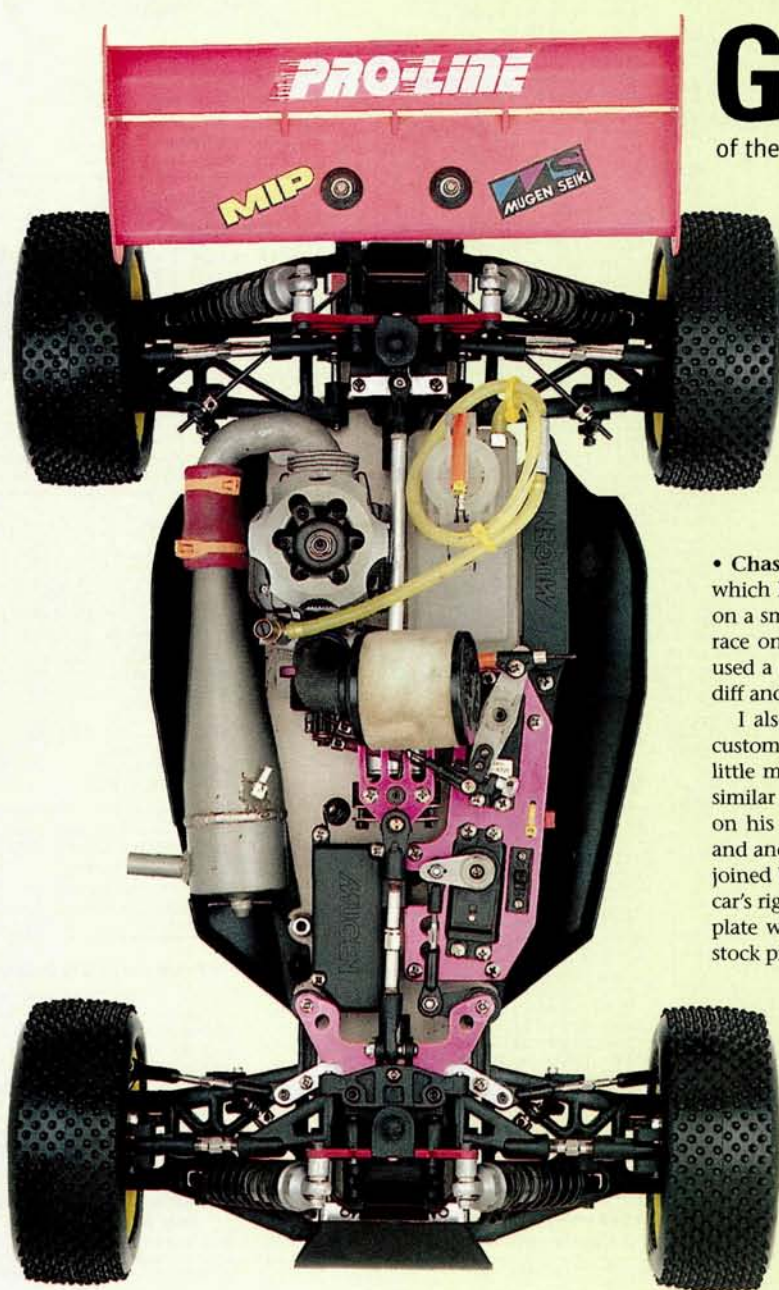
▲ After the paint had dried, I pulled off the masking tape and wiped the area down with rubbing alcohol to remove any residue. Using the same tip-and-trigger technique as I used for the windows and the outside of the flame, I started the "fade" of the flames with Competition Orange. I overlapped the orange onto the opaque blue.

▲ When the paint was dry, I sprayed on fluorescent yellow with a medium tip to get a larger area of yellow to fade off the orange. Then I finished the body off by using a spray can of Sprint White behind the orange and yellow. When the body is flipped over, it looks as if the white is fading into the yellow, and the flames have orange tips. The headlights were sprayed with a can of Indy Silver.

*Addresses are listed alphabetically in the Index of Manufacturers on page 209.

by Kevin Hetmanski

Tuning and Modifying the Mugen Super Athlete



GIVEN ITS WINNING track record, I was not surprised to find that the Mugen* Super Athlete is a competitive, forgiving race machine straight out of the box. No machine is perfect, however, and there's nothing like a season of racing to highlight the areas that can be improved.

Suitably informed with a bunch of Sundays' track feedback, I hopped up my Super Athlete with a few mods and a little factory-driver setup help. Without too much work, my Super Athlete is a stronger, better-handling car than the stock machine. Here's what I did

SECOND-LOOK MODS

- **Chassis.** The first item up for improvement was the chassis, which had some flex in it. Although flex is not really a problem on a smooth track with small jumps, the rougher tracks I usually race on merited the construction of a front-end brace. I simply used a titanium turnbuckle and two ball ends to link the center diff and the front gear case.

I also constructed a rear brace, although this required some custom work that may be beyond most modelers, as it requires a little machining on a milling machine and a lathe. My brace is similar to the one that Mugen factory driver Richard Saxton has on his car. An aluminum block is mounted on the center diff and another is mounted on the rear gear case. The two blocks are joined by an aluminum rod and ball ends. To further bolster the car's rigidity, I replaced the stock front upper plate and center diff plate with FTD* units, which are lighter and stronger than the stock pieces.

- **Brakes.** Powerful brakes are essential on an 1/8-scale buggy, and some simple mods improved the Super Athlete's binders considerably. First, I removed the springs from the brake linkage and replaced them with pieces of fuel tubing; the springs can only put so much pressure on the brake pads, while the stiffer tubing can transfer more force. I also modified the brake disks, and I created double-thick disks by gluing a pair of standard-thickness disks together. The braking system now operates with greater authority but is still easy to modulate.

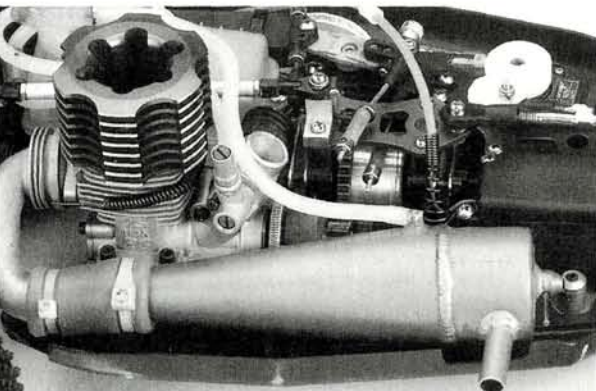
• **Dogbones.** One area of the Super Athlete that has caused me some grief are the dogbones. The front dogbones had loosened up and showed signs of wear after a few runs, and the pins in one of the rear dogbones had loosened and tended to migrate while running. I eliminated these problems by replacing the kit bones with MIP's shiny CVDs, front and rear. The CVDs run very smoothly, and their shiny plating helps to reduce wear on the diffs' outdrives. But their best feature is that they can be totally rebuilt; 1/8-scale cars are tough on driveline parts, and the CVDs can be repaired as parts wear rather than tossed out. To properly space the dogbones that join the center diff to the front and rear



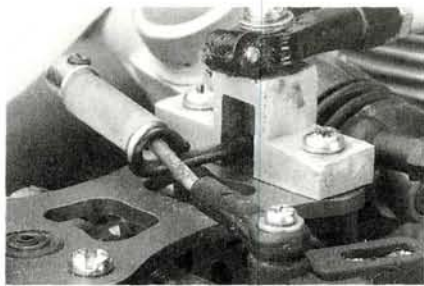
Richard Saxton showed me this swaybar mod: the suspension arm is relieved of some material within the webbed area, and the swaybar link is bolted to the inside of the arm. This places the link closer to the arm's center, and that transmits more energy to the link instead of wasting it as suspension-arm flex.

gear cases, I used 1/4-inch pieces of fuel tubing in lieu of the kit-supplied O-rings. The fuel tubing will not split like O-rings may, which can put you at risk of losing a dogbone mid-race.

I noticed some slop in the hub carriers of my Super Athlete, and it allowed the hub bearings a bit of free play. I shimmed the bearings with paper as a temporary fix before I added more durable steel shimstock to cure the problem. Other upgrades



An O.S. .21 RG mill and an EFRA 55 pipe handled the power-delivery chores reliably and capably. The RG is arguably the best bargain in .21 nitro power today.



FTD's red-anodized center diff brace is lighter and stiffer than stock and looks trick, too. The aluminum tie-rod standoff was custom-machined by yours truly (hold your applause until the end of the article). The piece is a little rough, but it works. The tie rod stiffens the rear of the chassis. Note the fuel tubing used to replace the stock brake springs.

include a complete set of MIP 1/8-scale springs, which work very well and greatly improve the suspension. In addition, fewer shock spacers are needed to adjust the ride height with the MIP coils. Inside the shocks, I used the stock shock pistons and 40WT Associated* silicone oil. To help reduce weight, FTD's new shock towers were added.

To further enhance the performance of



This front brace, constructed from a Lunsford tie rod, supports the Super Athlete's nose. An FTD front upper plate replaces the kit piece.

the front suspension, I added Mugen's optional front swaybar. I mounted the sway bar using a method suggested by Richard Saxton, which is pretty trick—see the pics.

I replaced the kit's plastic front and rear hinge-pin brackets with Mugen's aluminum versions, which are much stronger than the kit-supplied units. To further increase strength, I replaced all of the hinge pins with Lunsford* titanium pins and swapped the stock turnbuckles for Lunsfords as well. Beef!

The stock ball ends were replaced with Rocket City* heavy-duty ball ends that pivot more smoothly than the stockers. I wanted total steering response, so I also added Mugen's optional ball-

2ND LOOK SETUP

For final chassis tweaks, I copped most of the setup from factory pilot Richard Saxton; I haven't had cause to tweak my car much since following his suggestions. It's the setup he used to win the '97 Detroit race. Thanks, Rich!

FRONT SUSPENSION

- Damper position: C-1
- Damper oil: 40WT Associated
- Spring: MIP
- Spring spacing: 5mm
- Upper-arm position: stock
- Hinge-pin bracket position: stock
- Camber angle: 1 degree negative
- Down stop: stock
- Anti-swaybar: thin
- Toe-in/out: 0 degrees
- Tires: Pro-Line M2

REAR SUSPENSION

- Damper position: C-2
- Damper piston: stock
- Damper oil: 40WT Associated
- Spring: MIP
- Spring spacing: none
- Upper-arm position: stock
- Hinge-pin bracket position: stock
- Camber angle: 1 degree negative
- Down stop: stock
- Anti-swaybar: stock
- Tires: Pro-Line M2

DIFFERENTIAL OIL

- Front: 3,000WT
- Center: 10,000WT
- Rear: 5,000WT

bearing bellcranks. To add strength, I replaced the very thin, threaded steering links with Lunsford titanium turnbuckles, which are much thicker, fully adjustable and stronger.

• **Power and control.** My engine of choice is an O.S.* .21 RG. This powerplant has a lot going for it; it's economical, easy to tune and extremely reliable. Although it is not as potent as a full race engine, it is important to remember that any running engine will be faster than a finicky racing mill that has flamed out. Besides, I've yet to want for extra power on the tightest tracks I race on.

Finally, I used my trusty Airtronics* Caliper 3PS to keep the car pointed in the right direction and installed an Airtronics 94155 high-torque/high-speed servo for steering and a 94157 model for throttle control.

• **Tires.** I've had good luck on soft, loamy tracks with Pro-Line* M2-compound tires (you knew they made tires for 1/8-scale buggies, right?). The no-nonsense mini-pin tread pattern sheds dirt well and provides predictable traction with very good manners at the limits of adhesion.

*Addresses are listed alphabetically in the Index of Manufacturers on page 209.

Need to know what's new? What works well and what doesn't? This section is devoted to objective reviews of all R/C car accessory items. From gears and wrenches to motor brushes and shock springs; if you can use it with your R/C vehicle, you'll find it critiqued on these pages.



150
Thunder Tiger
Pro-12 BZ Engine



152
Team Associated
VCS Micro Shock

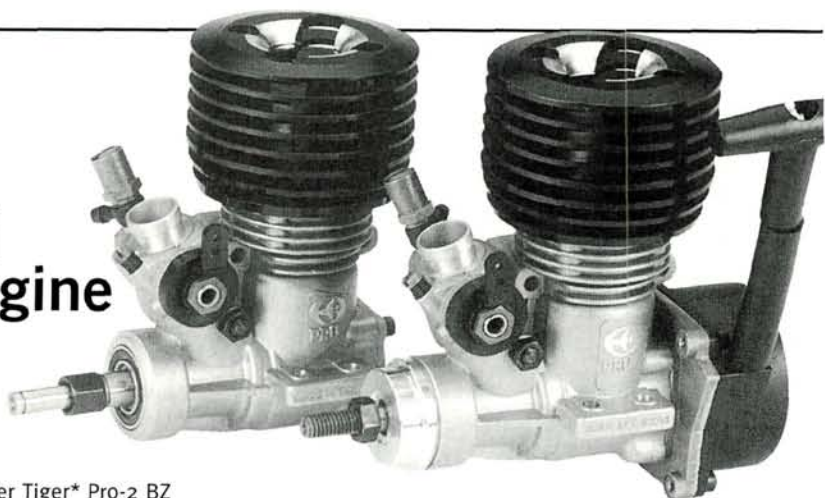


152
RPM Pro-Bond
Tire Fix



154
Dynamite
Mega 3 Charger

THUNDER TIGER Pro-12 BZ Engine Your next race engine?



The introduction of the Thunder Tiger* Pro-2 BZ could rock the 2cc engine world. More .12-size (2cc) engines are now available because of the increase in popularity of 1/10 nitro-powered cars, but this new player offers exceptional performance at a very reasonable price.

What makes the .12 BZ such a threat to the competition? This new design doesn't break new ground in terms of technology, but it's packed with features that should earn it a place on your A-list when you're deciding which engine to buy.

Kaz Mihara—who designed the .12 CZ-Z for O.S. Engines—designed this offering from Thunder Tiger, so we can be sure it has the characteristics that make his previous designs the most popular among 1/10 nitro racers. The .12 BZ, at least on paper, goes beyond any of Mihara's previous .12 designs in that its sleeve features true ABC construction (aluminum, brass and chrome). Its case appears to be of very high-quality aluminum, and the chrome-plated sleeve between the block and

Thunder Tiger's new Pro-12 engine is available in two versions—non-pull-start (BZ) and pull-start (BZX).

using this design, but it's widely held to be the best for performance and longevity.

Also key is the .12 BZ's carburetor—a very important element in a nitro engine. If the quality of the manufacturing is not up to par, it's very difficult to keep an engine tuned properly. This carb is of the highest quality and holds mixture settings well.

Before deciding to use the BZ as the standard engine in its RC10GT kits, Team Associated thoroughly tested it, and that brings me to another point about this engine: it's available with two different cranks—

- a standard crankshaft for use with most nitro-powered kits;
- a special extended crankshaft (AP designation) for use with the RC10GT. This special crankshaft includes a

clutch-bell pilot shaft, which is usually a separate piece that must be bolted onto it. This one-piece design eliminates the run-out, or wobble, that results from using a bolt-on piece that may not be perfectly in line with the shaft. This one-piece crankshaft is common in 3.5cc

engines designed for 1/8 on-road racing, but this is the first I've seen in a 2cc engine. And although it was designed for the RC10GT, it can probably be used in many other applications. If you decide on the AP version BZ, ask your supplier whether the crank will work in your application; I highly recommend it.

Although I haven't yet had a chance to test the Thunder Tiger .12 BZ in competition, I have had extensive experience with the engine in Thunder Tiger on- and off-road vehicles. The BZX—the pull-start model—always impressed me with its easy starting, robust low-end power and good top-end speed. The powerplant also holds its carb adjustments well, so you spend more time driving and less tuning. I plan to race my BZ-equipped RC10GT soon, and if it performs as I expect, it may soon become the engine of choice in the racing community.

—Steve Pond

	Pro-12 BZ	Pro-12 BZX (pull-start version)
Displacement	0.129ci (2.11cc)	Same
Bore	0.551 in. (14mm)	Same
Stroke	0.539 in. (13.7mm)	Same
Rpm range	3,000 to 30,000	3,000 to 27,000
Power output	0.56 b.hp @ 29,000rpm	0.54 b.hp @ 27,000rpm
List price	\$149.99	\$179.99
Available at	\$65.99	\$85.99

the aluminum piston (the "A" in "ABC") is brass and has a hard chrome plating ("B" and "C"). Cost and environmental considerations inhibit most manufacturers from

**For durability, the Pro-12's
brass piston sleeve is
chrome plated.**



TEAM ASSOCIATED

VCS Micro Shock

Easier to build and tune

With the introduction of the 10L30, Team Associated* brings us some new suspension technology that will surely be welcomed by on-road racers. The Associated* VCS (volume-compensating-system) Micro Shocks that were designed for the 10L30 will also work in just about any on-road car that uses shock absorbers. What's new? It isn't so much that these new shocks work much more smoothly than the micro shocks currently used on most on-road kits; it's that they are easier to build and tune.

Typical micro shocks, despite their good damping quality, are hard to build because of the compensating systems used in their design. Their conventional compensating system uses a spring-loaded floating piston, and that's the source of most installation problems. This piston has to be installed from the bottom while you hold the shock shaft in the fully compressed position. Doesn't sound so complicated, but while this is being done, the shock cap must also be screwed into place. Sounds as if a third hand would be useful, doesn't it? And racers often damage the fine-pitch threads on these plastic caps when installing them. In fact, it would take an average racer literally dozens of attempts to get these older shocks properly assembled. This new shock offers the same damping characteristics but



The VCS Micro Shock internals are installed on the shock shaft before assembly.

does away with much of that frustration.

The Associated VCS is not only effective, but it's also easy to assemble. Improvements have been made to its method of assembly and to the system itself.

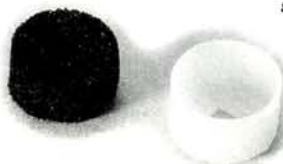
The VCS system is simply a foam disk that compensates for the volume of oil that's displaced when the shock is compressed. Like the shock's other internal components, this foam disk is loaded on the shock shaft, and a special installation tool is used to snap it into place with little difficulty.

The Associated VCS Micro Shock is still not the easiest shock to assemble, but it takes some long strides toward reducing the tuning headaches of on-road racers who use micro shocks. Assembly is easy enough to allow repeatable results, and that really helps make your car easier to fine-tune for specific track conditions.

As a final note, Associated is also releasing the VCS Macro Shock—the primary center shock on the 10L30. The design of this larger cousin of the Micro appears to be based on that of a short off-road Associated shock. It should have many applications in 1/10-scale on-road racing and touring cars.

—Steve Pond

The key feature of the VCS Micro Shock: its volume-compensating system. When the shock is compressed, the foam disk absorbs the oil that has been displaced.



LIKES

- Good compensating system.
- Springs for 1/12- and 1/10-scale cars.
- Less difficult to assemble ...

DISLIKES

- ... but still not easy to build.

RPM

Pro-Bond Tire Fixture

Tire mounting made easy

I think RPM must stand for "revelations per minute"; it seems there's a never-ending stream of high-quality products being churned out by Richard Royall and his trusty crew. New to the RPM lineup is the Pro-Bond Tire Fixture (part no. 8127) for sedans and minis. With this new tool, tire mounting is easier and cleaner, and the end result is a tire that's bonded better to the rim and runs truer.

How does it work? It's very simple: place your tire (with foam insert installed) and rim in the fixture. Put the "push ring" over the tire/rim and push down. The tire bead will break evenly all around. Then run the glue between the tire bead and the rim. When you release the push ring, the tire will re-seat and be entirely and consistently sealed to the rim. Use the special spacer and "mini" push ring to mount mini tires just as easily.

To ensure an even pressure all around the bead, I found it useful to practice compressing the tire before I started the job. You have to

use one hand to hold down the push ring and the other hand to apply the CA. The job is even easier if you have an assistant to compress the tire while you apply the glue. The Pro Bond is made of a slick material that CA won't stick to, so your tires won't stick to it, and clean-up is easy: just wipe off the excess glue.

I successfully mounted several sets of sedan and mini tires. The Pro Bond makes mounting tires quicker, cleaner and more accurate. This new bead bender should completely eliminate those wobbly, lopsided tire assemblies, and truer tires will give your sedan or mini better performance and more consistent handling. Those mounted tires will look more professional and last longer, too. That's a darn good bonus!

For off-landers, RPM offers a Pro-Bond Tire Fixture (no. 8128) to mount 1/10-scale off-road rubber (truck and buggy).

—Kevin Meyer

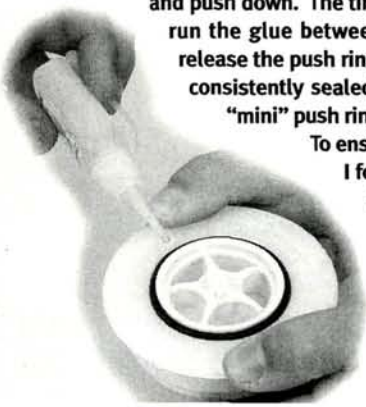
LIKES

- No more CA fingerprints on tire sidewalls!
- May also be used with mini tires.

DISLIKES

- To obtain the best results, you'll need an assistant.

For best results, have a helper pop the tire's bead while you drip in the CA. It's only slightly less easy to do by yourself; "walk" your thumb around the tool while you apply pressure with your other hand.



DYNAMITE

Mega 3 Charger

A reliable way to get power in, and out

For most R/C beginners, a charger is typically an inexpensive mechanical unit that gets juice into the battery pack capably, but does nothing more. While this is enough at first, users soon discover that they need more features to really get the most from their batteries. Even neophytes quickly learn that a way to discharge batteries and adjust amp rate would be useful to maximize battery performance.

Dynamite's* new Mega 3 Charger offers these features and a few more that should help delay the need for a more expensive peak-type charger. The Mega 3 has a familiar, 15-minute mechanical timer, but it also has a rotary knob with which you adjust the amperage delivered to the pack—great for charging 4-cell packs, and unusual on a mechanical charger. An analog meter shows the actual amp rate, and there are jacks for use with a voltmeter (not included).

The Mega 3 can also discharge packs, and a built-in circuit breaker adds a measure of safety without the need for spare fuses. Household current or DC power can be used to operate the Mega 3, so on-site charging via an automotive battery is as simple as connecting a pair of alligator clips, and reverse-polarity protection prevents the charger from being damaged if the clips are ever connected incorrectly.

Packs of 1200 to 2000mAh and 4 to 7 cells can be charged, and a trickle-charge mode is automatically engaged when fast charging is complete. Finally, a five-year warranty assures buyers of reliable service—highly unusual for an electrical product, but a testament to Dynamite's faith in its charger.

I used the Mega 3 to charge a bunch of packs for photo shoots and lunch-hour play. Trinity's 1500mAh Thunder Sport packs required two full 15-minute cycles at maximum amperage to reach peak charge, as indicated by the RadioShack digital voltmeter that I plugged into the unit's jacks (when the voltage reading starts to decrease instead of increase, the pack is fully charged, or "peaked"). If you don't have a voltmeter, you may estimate a peak charge by disconnecting the pack when it's warm to the touch (but not hot!).

Although the Mega 3 did get almost too hot to touch in the still air of my office, it did not have any trouble charging four packs in succession—nice to know, but it's good practice to let any charger cool between packs. While charging, I noticed that



my sample unit topped out at a charge rate of 4 amps, but the instructions indicate a 5A max. Four amps is certainly adequate, but it's less than the instructions promise. I called Dynamite's distributor, and the tech guy explained that the max amp rate varies with the internal resistance of the pack being charged.

Also, the Mega 3's charge rate tends to diminish as a pack is charged; the ammeter read 2 amps as the pack peaked. This sort of amp fall-off is typical of mechanical chargers and is not a defect.

I also tested the unit's discharge function, which dumps a pack at an indicated rate of 2 amps. This is a low rate for most racers and those in the know, who dump their packs at 20 amps to simulate the amp draw encountered during a race. A pack can be dumped at 2 amps, but it will take a while.

Like the charge function, discharge time is set with the timer, but the amp rate cannot be adjusted. I connected a fully charged 1500mAh pack to the unit and gave the timer knob a full twist. After 15 minutes, the charger was quite hot, so I disconnected the battery and completed the discharge cycle on a set of Deans discharge bulbs. The pack still had almost 2 minutes of juice (at 20 amps) left in it after 15 minutes on the Mega 3. With that in mind, I recommend the Mega 3's discharger be used only for draining off residual voltage after you've run your car. This will prolong the life of the unit, and thorough discharging will maximize battery performance.

I found the Dynamite Mega 3 reliable and user-friendly. Although it is a little more expensive than some other mechanical units, it has additional features, such as the ammeter, adjustable current knob and built-in discharger that add utility and value. Coupled with solid construction and an excellent warranty, the Mega 3 is a good choice for non-competitive hobbyists of all skill levels.

—Peter Vieira

LIKES

- Adjustable current makes it easy to charge 4-cell packs.
- AC/DC operation for go-anywhere R/C.
- Solid construction.
- Excellent warranty.

DISLIKES

- Gets pretty hot; a cooling fan is recommended.
- Discharges at a low amp rate.

*Addresses are listed alphabetically in the Index of Manufacturers on page 209. ■

Maintain your Motor

by Peter Vieira

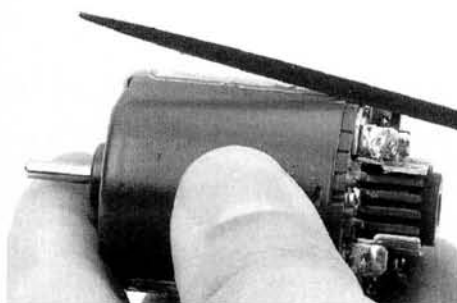
Really easy rebuild

IF YOU'VE BEEN reading R/C Car Action for a while now, you've probably noticed that we often suggest machine-wound modified motors as replacements for worn-out stockers. Machine-wound mods are available in a variety of winds to suit any performance requirement, are often less expensive than dyno-tuned stock motors and may save money in the long run, thanks to their best feature: they can be rebuilt.

"Sure," you say, "rebuilt with a fancy lathe and an expensive dyno for testing, right?" Well, yeah; that's the best way to do it, but certainly not the only way. If you're running a budget mod, you'll probably want to keep it running on the cheap, as well. No problem; just follow these steps to get that mod motor into like-new (or maybe even better!) shape—on a budget.

DISASSEMBLY

The first rule of disassembling anything is: *be certain you can put it back together.* With that in mind, don't forget to mark the endbell and motor can so you'll be able to reassemble them the same way they came apart. If you skip this step, you may find that the positive and negative sides of the endbell have been reversed once the motor is back together. Scribe the can and endbell with a file or rotary tool so you can easily reassemble them later. Don't use a marking pen; it will wash off during the rebuild.



MEET THE PATIENT

They say "you always hurt the ones you love," and that holds true for R/C gear as well; when I like a product, I pound the stuffing out of it. The Trinity* SpeedGems 2 Opal shown here is no exception. The last time I ran this potent 10-turn spinner, I geared it to the moon; smoke was coming off the endbell when my run was finished. I cooked it! That was the final straw in a bale full of abuse. Until I took the motor out of the car, my mantra was, "If it ain't broke, don't fix it. Or clean it. Or stop the car if it makes funny noises and gets real, real hot." Needless to say, this motor is due—so let's do it.

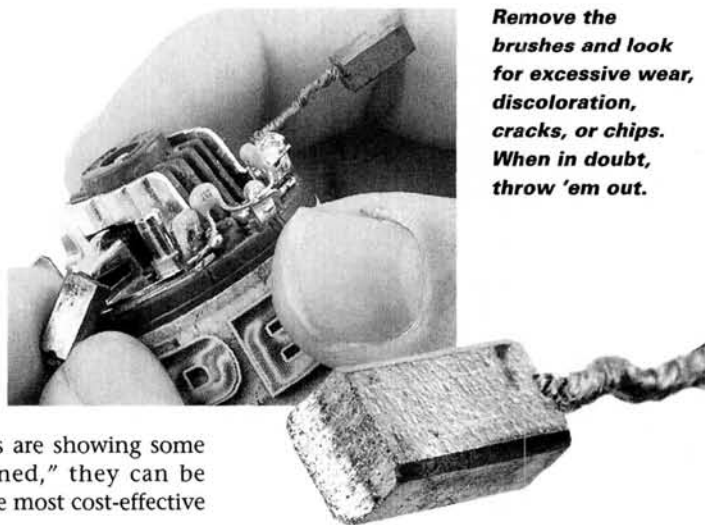
This generally abused Trinity SpeedGems motor is ripe for a rebuild.

CLEANING THE COMM

Before getting too excited and tearing off the endbell of your ailing motor, now is the time to use a comm cleaning stick, if you have one. Comm cleaning sticks are usually made of fiberglass or rubber, and they are designed to clean the comm through an empty brush hood. Carbon buildup in the slots of the commutator can be especially harmful to your motor's performance. Comm sticks, particularly the fiberglass variety, are useful for removing carbon deposits, not to mention other debris that can build up on the comm. You'll want to perform the comm cleaning first, unless you particularly enjoy repeated assembly and disassembly of your motor. (I didn't think so.)

- As long as the comm isn't visibly out of round and so badly damaged that only a lathe could bring it back to life, it can be easily cleaned. Remove both brushes and insert the comm stick through one of the brush hoods. Apply very light pressure to the comm stick (press about as hard as you would to ring a doorbell) and spin the motor's shaft about a dozen times. I've found that installing any pinion gear on the motor's shaft makes it easier to turn the armature for comm cleaning. When you've finished, the comm should be free of any dark, black carbon deposits. Once you're satisfied that the comm is clean, it's time to go in and get rid of the rest of your motor's gremlins.

- OK; now we can take the motor apart. First, inspect the brushes. In this case, they have been reduced to junk. Even though there is plenty of material left, excessive heat has discolored the brush and glazed its surface. There's no way this brush could be working efficiently, so into the trash bin it goes. If your brushes are showing some wear but aren't "burned," they can be cleaned and reused. The most cost-effective



Scribe the can and endbell with a file before you take apart the motor, to ensure it will be reassembled with the proper polarity.

You can't see it in black and white, but this brush has a bluish tint that indicates overheating. Although it will still allow the motor to run, this brush is compromising the motor's performance.

method of cleaning brushes is to use the round end of a comm stick. This helps to clean off the carbon deposits that tend to build up over time. New brushes are fairly inexpensive, though, and I recommend that you replace them whenever you rebuild, no matter what.

- With the brushes removed, we can proceed to remove the endbell. Work over a towel to catch any small screws or



Brushes with light or moderate wear can be cleaned with a comm/brush stick and reinstalled.

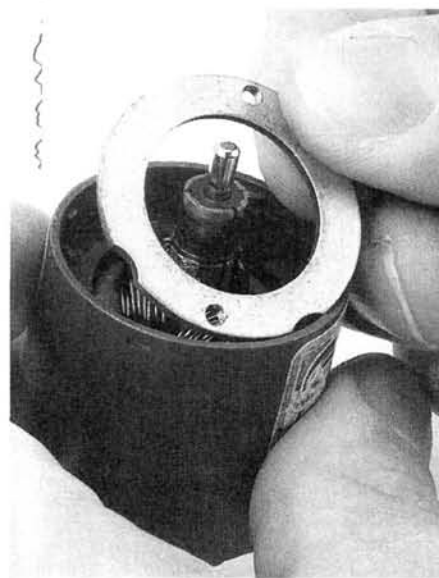
shims that might fall out. Remove the two screws that pass through the endbell and gently pull it off; you may need to rock it a little to free it. You'll notice a few shims on the end of the armature, along with a single, large phenolic washer. Check inside the endbell for washers that may be stuck to the bearing and collect any you find. Remove all the washers and set them aside.

- The armature cannot be taken out until the timing ring has been removed. Use an Allen wrench or screwdriver tip to rotate the ring until the half-round "gates" line up with the stamped "keys" of the can, then pull the ring out. If the retaining ring is made of steel, the motor's magnets are going to be holding it down, so this will require a little force, but the ring should come out easily. Once the ring is out, the armature can be removed. There will be more shims on the output shaft end of the arm, or stuck to the can bearing. Remove them and set them aside, separate from the others.

Left to right:
note the large, phenolic washer and two smaller, spacer washers above the comm.

Rotate the timing ring until the half-round "gates" line up with "keys" in the can ...

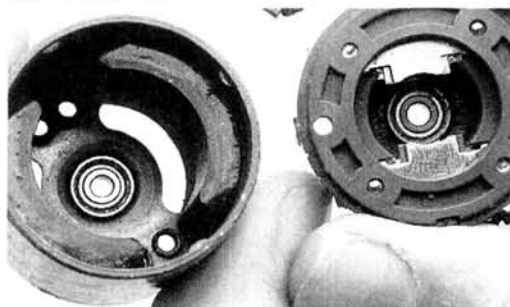
... then lift out the ring. You'll need to give it a tug to free it from the pull of the magnets.



CLEANING



The bearings in a modified motor get a workout; blast 'em with motor spray, let them air-dry, then lube.



Use a quality R/C motor spray to clean all the motor's parts. Don't use automotive brake cleaner. Although this product also uses the 1, 1, 1 trichloroethylene often found in motor spray, brake cleaner is more concentrated and may harm the armature—or you. Some of the new motor sprays don't use trichloroethylene at all; these are recommended. Be sure that the bearings in the endbell and in the can get a good blast. If they're really filthy, you might have to remove them to give them a more thorough cleaning. If you must remove the bearings, use something soft to do the job, such as a piece of dowel or a plastic tool. To clean a really dirty bearing, try Robinson Racing's* Bearing Blaster; its concentrated spray blasts right through the bearing. Allow the bearings to air-dry thoroughly, then lube them with light oil.

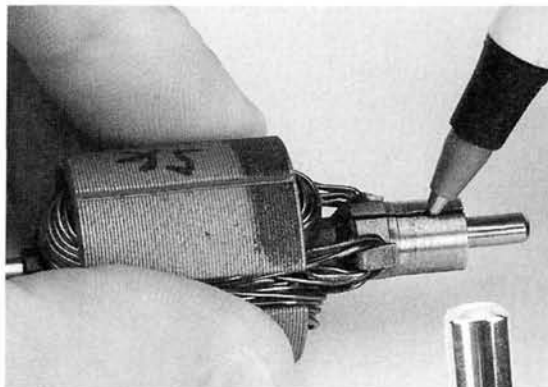


If you can't get the bearings clean while they're in the can or endbell, pop them out and clean them with a Robinson Racing cleaner. This device concentrates the cleaner for a high-pressure blast that will remove even the most stubborn crud.

HOW'S THE COMM?

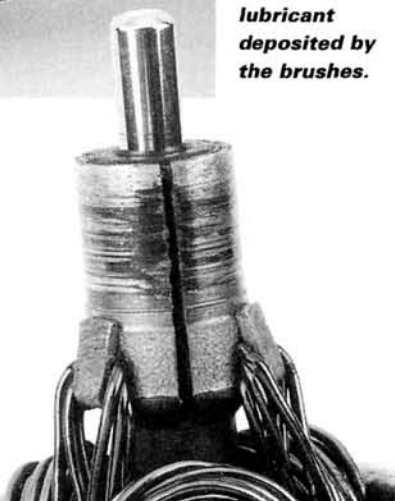
The commutator should appear relatively smooth and have a bright copper sheen; my SpeedGems' comm definitely doesn't! Looks aren't everything, though; if you drag your fingernail down the face of the comm, you'll be able to feel any scratches or gouges. In this case, the comm is actually quite smooth and is still slightly glazed from the brushes' lubricant, but this is OK. What you want to look for is leftover carbon deposits in the slots of the comm. If there are significant traces of carbon left after the cleaning with a comm stick, it may be time to seek out a hobby shop with a comm lathe. If the comm is reasonably clean, however, it's time to prep it for reinstallation.

- To prevent premature brush wear, it's a good idea to burnish the edges of the comm slots. When a comm gets worn down



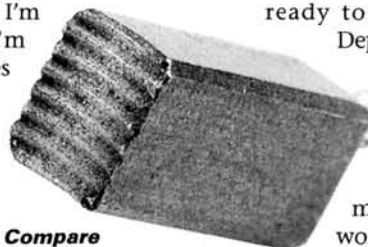
This comm looks ugly, but a fingernail dragged down its surface reveals it's still smooth. The black glaze is actually lubricant deposited by the brushes.

from use and regular cleaning, it tends to develop sharp edges that can eat up your new motor brushes pretty quickly. Run a ball-point pen or a burnisher up and down in the comm slots to slightly round their edges. (If you use a ball-point pen, be sure to use a shot of motor cleaner when you've finished to clean off any ink that might be left behind.)



BRUSHING UP ON PERFORMANCE

I'm replacing the wasted stock brushes with serrated brushes; they are highly recommended because of their almost instant break-in. You can't go wrong with Trinity brushes in a Trinity motor, so I'm installing a pair of RC4380 serrated "hard" brushes, which wear well and are easy on the comm. I'm big on convenience, so I'm simply screwing the brushes to the endbell rather than soldering them on. The brush-hood screws also clamp the endbell hardware to the molded endbell, so be careful not to knock the brush hoods out of alignment when swapping brushes. Since my SpeedGems motor has been overheated more than once, I'm also



Compare this new Trinity serrated brush with the worn original. The fine ridges in the brush face allow it to seat quickly.

replacing the brush springs (heat weakens springs, y'know). As a final step, all capacitors should be checked for broken leads and cracked ceramic and replaced as necessary.

That's it! Your modified motor should now be ready to rock with renewed performance. Depending on how bad it was before the rebuild, you should notice cooler running and longer run times, as well as a little extra squirt. Geared correctly and properly maintained, a budget mod will consume only a few dollars' worth of brushes from season to season. If you stay on top of your rebuilds (once every hour of running, or once every ten packs), your motor can deliver stock-beating performance almost indefinitely.

*Addresses are listed alphabetically in the Index of Manufacturers on page 209.

REASSEMBLY

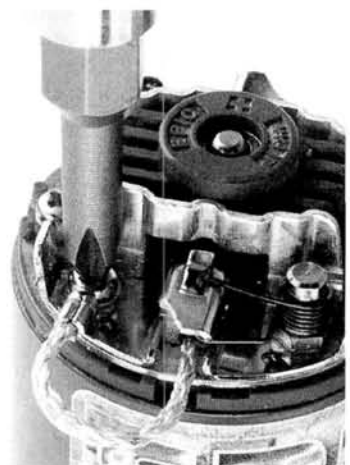
At this point, you could simply put all the parts back together as they came apart, paying careful attention to the number of washers on each end of the armature. We're going to go the extra mile, however, and make sure the armature is properly placed within the can's magnetic field.

- Reinstall the armature and timing ring without washers and put on the endbell. Give the armature a spin, then tug on the output shaft. There should be some free play before the arm bottoms out on the can. Likewise, you should find some play when you push the arm up into the endbell. The position the armature takes between these two extremes is determined by the can's magnetic field, and wherever the armature "wants" to be is where it will operate most efficiently. Once this position is determined, the free play will be taken up by the washers.

- Give the arm another spin to be sure that it has found the "sweet spot"; then use a permanent marker to make a line on the output shaft where it exits the can. Disassemble the motor again, add a washer to the output shaft, reinstall the arm and check the line to see whether the armature position is correct; if not, add another washer. Once the spacing is correct, you can add washers to the commutator end. Always install the large, phenolic washer first, then add the remaining washers. If you crack the phenolic washer, or lose any of the small ones, you can obtain replacements from Trinity. With the endbell reinstalled, there should be just a tick of free play left. If the armature binds, you have too many washers in there. Once the spacing and free play feel right, make certain the marks you made to align the endbell are lined up, then tighten everything down.



With all spacers removed, the armature is installed and spun. The position of the shaft is marked with a permanent marker. This mark is a reference point for correct spacing when installing the motor washers.



Racers may opt to solder their brushes into place, but the rest of us can keep it convenient and use screws.

(Continued from page 80)

I immediately noticed how "light" this car felt. The stock tires worked well with this surface, and the car was loaded with steering. To me, it's much easier to dial out steering than to find ways to get more.

As soon as I reached the end of the long straightaway, I prepared for the tight, 180-degree turn that leads into a quick set of doubles. The Fireblade turned in beautifully, but when I unloaded the horsepower through the slipper-less tranny, it was a handful. To compensate, I set my 3PS's throttle exponential to negative 20. This softened throttle response, giving me the cushion that I needed.

Clearing all the jumps was no problem, and the car steered aggressively through the challenging track layout without any loss of stability. The Fireblade's suspension handled all the rough portions like a champ, and the plastic shock bodies worked well. Over the biggest jumps, the car landed like a wet rag and kept going, even though I was on full throttle.

On my second practice run, the Fireblade seized and sounded as if it had stripped a spur gear. I headed back to my pit, where I discovered that the spur was fine. The problem was that the tranny was not rotating. I disassembled the tranny and discovered the idler gear had taken a permanent vacation! Not only that, but the debris from the idler also damaged the input shaft gear. I had an alloy idler and extra gears with me, so I thanked my lucky stars and put the tranny back together. By then, the qualifiers were coming up in a hurry. One practice run with a new car; was I ready to face the competition?

At the start of the first qualifier, I negotiated through the traffic but landed on my lid in the doubles. The rest of the pack flew by me, and I found myself in dead last. I decided to push the Fireblade to its limits, since I desperately needed to make up some ground! By the 3-minute mark, I had battled up from last and was a strong contender for second. When I had the opportunity, I gambled and made a dangerous

outside pass that earned the second position, made no more mistakes, and finished in the two spot.

In the second and third qualifiers, I ended up second and third (irony!). The competition was good, and I was the third qualifier going into the main event.

At the start of the Main, there was a huge pileup, and the Fireblade was sandwiched—right in the middle of the chaos! As I watched the first-place driver blast away to a clear track, I thought, "Here I go again!" Almost the last to get turn-marshaled, I knew I had to drive like my life depended on it to make up ground. The Fireblade worked with me and started to pass traffic. At the 3-minute mark, I realized that not only was I in second, but I was reeling in first in a hurry! Unfortunately, time was running short and as I was closing in on the first-place driver, the finish tone sounded. This was exciting racing! I congratulated the winner and headed back into my pit, knowing I could take first with a little more luck.

FINAL THOUGHTS

The Schumacher Fireblade USA is a potent race car. After racing it, I have arrived at a few conclusions about the need for upgrades:

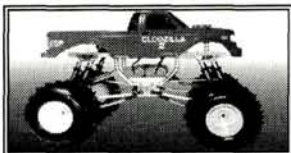
- To protect the tranny and smooth power delivery, consider a slipper clutch.
- An alloy idler gear may also be installed to further strengthen the drive train.
- Though the plastic shocks ran flawlessly, think about installing alloy shocks for better long-term wear.

I found the tuneability of the Fireblade's steering helpful: depending on your driving habits, you can dial in insane amounts or take it out to make the car very forgiving.

Perhaps best of all, this car attracts a lot of attention—cool! There were always people—the curious and competitors—around my pit area looking closely at this new kid on the block. The Fireblade USA is backed by Schumacher's excellent customer service, and I think you'll be seeing more of these cars at your local track.

*Addresses are listed alphabetically in the Index of Manufacturers on page 209.

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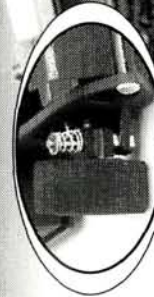
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Hobbytown USA Raceway, 450-Q Schillinger Rd. N., Mobile, AL 36608; Rob & Kari Baker, (334) 633-8446

Lagoon Park R/C Raceway, 2730 Lagoon Park Dr., Montgomery, AL 36109; Alex Love, (334) 272-6438

Phenix Raceway & Hobby, 2006 Opelika Rd., Phenix City, AL 36867; Chris Watson, (334) 298-9786

R/C Hi-Tech Raceway, 3303 Meridian St., Huntsville, AL 35811; Rick Chambers, (205) 539-1347

R/C Thunder Tracks, 1530 Schillinger Rd., Mobile, AL 36675; Jerry Hurst, (334) 645-2787

ALASKA

Fairbanks R/C Car Club 510 Janey Ave. Fairbanks, AK 99701; Dan Anderson, (907) 456-5494

ARIZONA

Cottonwood R/C, S. 6th St., Cottonwood, AZ 86322; Sal Cirincione, (520) 567-6830

Havas R/C Raceway, 1400 S. Smoketree (Rotary Park), Lake Havasu, AZ 86403; Jeff Roe, (520) 855-2226

HobbyTown Mountain Raceway, 1500 E. Cedar Ave., Cedar Hills Shopping Center, Flagstaff, AZ 86004; Richard, (520) 214-9887

HobbyTown Raceway, 13802 N. Scottsdale Rd., Scottsdale, AZ 85250; (602) 948-3946

HobbyTown Raceway, 1915 East Baseline Rd., Gilbert, AZ 95234; Dennis, (602) 892-0405

Hobbytown Raceway, 1102 E. 22nd St., Tucson, AZ 85704; (520) 882-8888

HobbyTown U.S.A., 5030 E. Ray Rd., Phoenix, AZ 85044; Linda McFarland, (602) 598-5282

Quarter Flash's Squirtin' Dirt Raceway, 16301 S. Santa Rita #C, Sahuarita, AZ 85629; Dave, (520) 625-9274

R/C Sports Mania, 3550 N. 35th Ave., Phoenix, AZ 85017; Brian Dick, (602) 278-3671

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Thunder Mountain R/C, 13258 Plaza Mavia, Sierra Vista, AZ 85635

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Grand Slam Superspeedway, 5300 S. Zero St., Ft. Smith, AR 72901; Bryon Shumate, (501) 648-1994

Hobby Town USA, 356 E. Joyce, Fayetteville, AR 72703; Darrell Irvin, (501) 571-3730

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Cats West/Hawk's R/C Raceway, 1201 West 10th St., Antioch, CA 94509; Mike Rogers, (510) 779-1665

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Discount Hobby Warehouse, 7750 Convoy Ct., San Diego, CA 92111; (619) 560-9633

Freedom Park Raceway/Ventura Roadrunners, Freedom Park Dr., Camarillo, CA 93010; Chris Jones, (805) 656-8436

Greater Los Angeles R/C Racing Club, 3756 Cardiff Ave., #305, Los Angeles, CA 90034; Nikko Ko

Hobby Central Raceway, 34255 P.C.H., Unit 107, Dana Point, CA 92629; John, (619) 513-0373

Hobby Central II Raceway, 13461 Community Road, Poway, CA 92064; John, (619) 513-0373

Hobby Paradise Raceway, 1880 Art Gonzales Pkwy., Selma, CA 93662; Steve Keiser, (209) 896-4804

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Lucerne Valley Raceway, 32800 Old Woman Springs Rd. #4, P.O. Box 2047, Lucerne Valley, CA 92356; Frank Rodrigue, (760) 248-7305

M n M Hobbies, 4225 Prado Rd., Ste. 103, Corona, CA 91720; Joe Stanovich, (909) 272-3545

M.R. C.A.R., McGreed Loop, Merced Airport, Merced, CA 95340; (209) 723-6662

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Perris Recreation R/C Track, 120 N. Perris Blvd., Perris, CA 92370; (909) 943-6603

R/C Velodrome, P.O. Box 2403, Julian, CA 92036; Peyton Read, (760) 765-3463

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-  **Indoor**
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Frontier Race Track, 15260 N.E. 244th Ave., Salt Springs, FL 32134; Harold Reel, (352) 685-2881


G & C Hobbies, 1228 Hypoluxo Rd., Lantana, FL 33462; George, Debbie, or Carol, (561) 547-3812


Gainesville R/C Speedway, P.O. Box 693, Melrose, FL 32666; 130 NW 14th Ave., Gainesville, FL 32601; (352) 495-3600


G & C Hobby Raceway, 1228 Hypoluxo Rd., Lantana, FL 33462; George, 561-547-3812


Greater Orlando Auto Racers, 970 Keller Rd., Altamonte Springs, FL 32714; Dave Mottin


Hobby World Raceway, 7273 103rd St., Jacksonville, FL 32210; Greg, (904) 772-9022

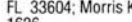

The Hobby Stop Raceway, 5765 Manatee Ave. W., Bradenton, FL 34209; Rich Konnen, (941) 798-9638

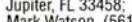

The Hobby Stop Raceway, 2454 Land O'Lakes Blvd., Land O'Lakes, FL 34639; Rich Konnen, (813) 948-0606


Miami R/C Raceway, 12546 S.W. 88 St., Miami, FL, 33186

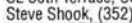

Minnreg R.C. Club, 6340 126th Ave. N., Clearwater, FL 34624; David Fox, (813) 787-6032

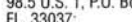

Monster Hobbies, 231 SE 1st Ave. Boca Raton, FL 33432; Steve Augustus, (561) 392-5447

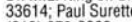

Morris Kohl's Raceway and Hobby Shop, 1202 W. Waters Ave., Tampa, FL 33604; Morris Kohl, (813) 931-1626


My Rose, 1695 W. Indiantown Rd., Jupiter, FL 33458; Mark Watson, (561) 744-3800


NORRA, 3300 Santa Barbara Blvd., Naples, FL 33999; Jerry Pecar, (941) 455-9065 or Mark Benfield, (941) 263-6861


Ocala Radio Control Car Club, 3500 SE 30th Terrace, Ocala, FL 34471; Steve Shook, (352) 694-5147


Paradise Speedway, Mile Marker 98.5 U.S. 1, P.O. Box 738, Key Largo, FL 33037; Joe Ravard, (305) 451-3707


Paul's Stadium Raceway, 4511 W. Dr. M.L. King Jr. Blvd., Tampa, FL 33614; Paul Surette, (813) 872-8662


PBG R/C Motor Park, 6351 Barbara St., Palm Beach Gardens, FL 33418; Doug Gleason, (561) 743-9791 or Tim Case, (561) 627-2608


Pro Hobbies Speedway, 715 N. Lake Pleasant Rd., Apopka, FL 32712; (407) 886-4615


Port St. Lucie Racing, 3626 SW Rivera St., Port St. Lucie, FL 34953; Frank Spadavecchia, (561) 336-8711


River City R/C Car Club, 9711 Sharing Cross Dr., Jacksonville, FL 32257; Bill Fraden, (904) 268-1948


Sarasota RC Speedway, 8475 Cooper Creek Blvd., University Park, FL 34201; Jim Wilson, (941) 358-7047


Sea Coast Watercraft and Hobby, 3119 Barrancas Ave., Pensacola, FL 32507; Jim, (888) 865-3885

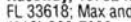

South Daytona R/C Raceway, 2121 S. Ridgewood Ave., South Daytona, FL 32119; Mike Bean, (904) 426-6481

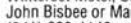

South Palm Beach Racers, South County Regional Park, West Boca Raton, FL 33486; Mike Fazio, (561) 338-5367


Superior Hobbies R/C Parking Lot Racing, 430 E. Hwy. 436, Ste. #106, Casselberry, FL 32707; Rob Michael, (407) 834-9299


Tallahassee R.C. Raceway, Tom Brown Park, Easterwood Dr., Tallahassee, FL 32311; Roland Costine, (904) 671-2814


Tampa Bay R/C Club, P.O. Box 10224, St. Petersburg, FL 33733; Dick Gillette, (813) 526-0744


Tampa Hobbytown R/C 4 Slot Car Raceway, 15702 N. Dale Mabry, Tampa, FL 33618; Max and Judy Rosenroth, (813) 968-7233


Winterset Raceway, U.S. Rt. 27 South, Winterset Motel, Sebring, FL 33872; John Bisbee or Mac Mixer, (941) 699-1140 or (941) 385-4448


GEORGIA

Dalton Raceway, 2300 Chattanooga Rd., Dalton, GA 30720; (404) 226-6699


Echeconnee Superspeedway, 2149 Richardson Dr., Macon, GA 31206; Andy Thompson or Cliff Kline, (912) 788-8731


Emerald City R.C. Speedway, Highway 40 East, East Dublin, GA, 31021; Terry Cook, (912) 272-3856

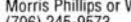

The Flight Box Hobby Shop, 3134-C Rockmart Rd., S.E., Rome, GA, 30161-6826; Leslie Duke, (706) 234-3014


Hobby Town Raceway, 2301 Airport Thruway, Columbus, GA 31904; Frank Bastos, (706) 660-1793


HobbyTown Raceway, 225-B Tom Hill, Sr. Blvd., Macon, GA 31210; Marcus Lee, (912) 474-0061

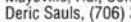

Lake Mayer Raceway, 1430 Dale Dr., Savannah, GA 31406; (912) 598-9709


The Racer's Edge, 1530 Hwy. 19 N., Thomaston, GA 30286; Roger or Mark Walls


Sandy Cross Speedway, Rt. 1, Box 1071, Hwy. 51, Royston, GA 30662; Morris Phillips or Wayne Fowler, (706) 245-9573


SHILOH R/C Raceway, 6362 Shiloh Rd., Hahira, GA 31632; Doug Burnett, (912) 794-2507


Silver Wings Raceway, 5611 Riverdale Rd., College Park, GA 30349; M. Bradshaw, (770) 991-2225


Stinger RC Super Speedway, 3769 Maysville, Rd., Commerce, GA 30529; Deric Sauls, (706) 335-5006 or (706) 335-9044


Sugar Bowl R/C Speedway, 5272 Nelson Brogdon Blvd., Sugar Hill, GA 30518; Shelley Bailey, (770) 945-6709


Valdosta Hobbies, 3998 Inner Perimeter Rd., Valdosta, GA 31602; Ron Hood, (912) 244-2101


HAWAII

A.S.I. Raceway, 4516 Akoa Rd., Kapaa, HI 96746; Arnold Morales, (808) 821-8132


Garden Isle R/C Racers, 5855 Ahakea St., Kapaa Kauai, HI 96746; Arnold Morales, (808) 823-0856


Kakaako Water Front Park Dragway, 98-029 Hekaha St., Bay #32, Alea, HI 96701; James Inkyo, (808) 487-5155


Keeli Lagoon Park, Leeward Community College, Waipahu, HI 96797; (808) 676-5486


Maui R/C Racing Association, 430 Hookahi St., #13, Wailuku, HI 96793; Tritech R/Hobbies, Radio Control Association, (808) 244-0526


Pearl City Raceway, 98-029 Hekaha St., Bay 32, Alea, HI 96701; James Inkyo, (808) 487-5155


Radio Control Hawaii, 474 Kalanikoa St., S-104, Hilo, HI 96720; Glenn Shiroma, (808) 935-5629


Team PRC Racing Club, 176 Mamo St., Hilo, HI 96720; Charlie Kawamoto, (808) 935-3561


IDAHO

Capital Dirt Burners, 301 N. Bruce, Boise, ID 83712; Mike Ard, (208) 345-3906


Dirt Stuff Plus, 5344 N. Yellowstone Hwy., Idaho Falls, ID 83401; Brian Krah, (208) 522-7576


ILLINOIS

Adam's R/C Raceway, 7201 S. Adams Bartonville, IL 61607; Ray Tighe, (309) 633-9300


AJ's Raceway & Hobby, 10211 Kesinger Road, Dekalb, IL 60115; A.J. Schultz, (815) 756-2772


C.I.R.C.A., 905 Bibbs St., Jacksonville, IL 62650; Sport 'n' Hobby, (217) 245-1375


C&R Hobbies, 39 E. Jones, Milford, IL 60953; Ray Craighead, (815) 889-4073


Dan's Hobby World, 18415 S. Halsted St., Glenwood, IL 60425; Dan, Bruce or Josh, (708) 754-7988


Gary's R/C Speedway, 1712 East Grove, Rantoul, IL 61866; Gary Dale Fleisher, (217) 893-9297


Glenwood Roseway, 18417 Halsted, Glenwood, IL 60425; Don's Hobby World, (708) 754-7988


G&R Raceway & Hobbies, 533 Bank Lane, Highwood, IL 60040; Randy Rose, (847) 432-9600


HobbyTown Raceway, 9346 Virginia Rd., Lake in the Hills, IL 60102; Mike Hollingsworth, (847) 458-1777


HobbyTown Raceway, 2103 N. Veterans Pkwy., Bloomington, IL 61701; Gary Pritts, (309) 664-4451


Leisure Hours R/C Raceway, 24121 W. Theodore, Bldg. 1, Plainfield, IL 60544; Scott Hill, (815) 439-1777 (track), (815) 439-1477 (shop)


Machesney Park, 1220 Shappert Dr., Machesney Park, IL 61115; (815) 282-1311


Marty's R/C Hobby, 1335 E. Broadway, Bradley, IL 60915; Gail or Marty, (815) 933-8441


Mitey Motor Speedway, 1109 N. Bloomington St., Rte. 23, Streator, IL 61364; Doug, (815) 672-4212


Monroe R/C Raceway, 26049 Ridgeland Ave., Monroeville, IL 60449; Roy or Roberta Moody, (708) 534-2422 (track), (708) 799-5597 (office)


Pontoon Raceway, 3670 St., Rte. 111 Granite City, IL 62040-4304; Pat or Skip, (618) 931-1206


Outlaw R/C Speedway, 1614 Broadway, Mattson, IL 61938; (217) 234-6229


R/C Workshop, 3100 S.W. Adams St., Peoria, IL 61605; Al Kretz, (309) 673-4860


Radio-Active Raceway, 751 N. Bolingbrook Dr., #15, Bolingbrook, IL 60440; Jim, (630) 759-7557


Rector's R/C Raceway, RR 3, Box 104, Albion, IL 62806; Tim Wolfe, (618) 842-9379 (M-F), (618) 446-3282 (Sun.)


Shiloh Eagles Superspeedway, 308 N. Virginia Ave., Belleville, IL 62220; (618) 277-6030


SIRCAR Raceway, 1200 N. Marion, Carbondale, IL 62901; (618) 549-5885

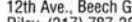

Stanton Hobby Shop, 4718 N. Milwaukee, Chicago, IL 60630; Kevin Kane, (773) 283-6446

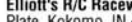

Valley Farms R/C Raceway, 706 Bypass 20, Cherry Valley, IL 61016; Dean or Debbie, (815) 332-4516 or (815) 547-5984


Wep Speedway, RR #2, Box 44 Lawrenceville, IL 62439; Bill Poe

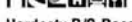

INDIANA

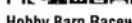
Bremen Racing Ent., 308 N. Bowen, Bremen, IN 46506; Dale Heuberger, (219) 546-3807


Dirt Slinger's Raceway, 546 North 12th Ave., Beech Grove, IN 46107; Phil Riley, (317) 787-3815


Elliott's R/C Raceway, 2140 North Plate, Kokomo, IN 46901; (765) 452-0163


G.R.C.C.C. Inc., 1651 W. Franklin St., Elkhart, IN 46516; Pete Russell, (219) 293-1827


Hardesty R/C Raceway, 11 East Plymouth St., Hamlet, IN 4653; Max Hardesty, (219) 867-8600


Hobby Barn Raceway, 1950 Springhill, Terre Haute, IN 47802-9694; (812) 299-5773


Hobbytown U.S.A., 5385 E. 82nd St., Indianapolis, IN 46250; Bill Scott, (317) 845-4106

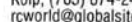

Kokomo Hobby & Radio Raceway, 1108 E. Markland, Kokomo, IN 46901; (765) 457-5060

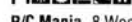

P&T Hobbies and Raceway, RR 2 (Hwy. 60), Mitchell, IN 47446; Paul Weber or Tom Logsdon, (812) 849-6666; email: pntohobby@kiva.net


Race Street Hobbies, 1126 1/2 Race St. New Castle, IN 47362; Jim Burke, (765) 521-4888

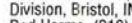

RC Barn, 310 N 125 W, Monroe, IN 46772; Mark Lengerich, (219) 692-4600


R.C.R.C. Raceway of Salina, 1300 E. Crawford, Bill Burke Park, Salina, KS 67401; Calvin Calp, (913) 823-9588


R/C World of Indiana, 2246 West U.S. Hwy. 36, Lynn, IN 47355; Joe Kolp, (765) 874-2464; e-mail: rcworld@globalsite.net; web: www.RCWORLD.com


R/C Mania, 8 Wood Ct., Hebron, IN 46341; Ron Trobaugh, (219) 996-6288 (shop); (219) 762-5365


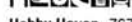
The Rink, 7900 Whitcomb, Merrillville, IN 46410; Don Reiner, (219) 769-8113


Rod's Off-Road R/C Track, 800 N. Division, Bristol, IN 46507; Rod Harms, (219) 848-7848


IOWA

Delb's Speedway, 423 11th Ave. So., Clinton, IA 52732; Rusti's Miniatures and Hobbies, (319) 243-2697


Dubuque R/C Speedway, Dubuque County Fairgrounds, Dubuque, IA 52001; Paul Conlon, (319) 556-2736


Hobby Haven, 7672 Hickman Rd., Des Moines, IA 50322; Rick Marble, (515) 276-8785


Inside Challenge, 2028 Main St., Keokuk, IA 52632; Jessie, (319) 524-2225

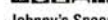

Iowa City R/C Racing Association, 1700 First Avenue, Iowa City, IA 52240; Hobby Corner; (3

Ottawa Outlaw Raceway, 114 South Main, Ottawa, KS 66067; Tom Wilson, (913) 242-1450


R/C World Raceway, 217 Brownie Ave., Scranton, KS 66537; John and Kyle, (913) 793-2313


RCRC Raceway, 507 N. 4th, Atwood, KS 67730; Bob Dunker, (913) 626-3261

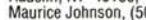

KENTUCKY

Bourbon City Raceway, 213 West Stephen Foster Ave., Bardstown, KY 40004; Ryan Barnes, (502) 349-0069


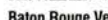
Johnny's Speedway, 3114 North St., L.Loyd Greenup, KY 41144; Charles, (606) 473-0075


Pit Stop Hobbies, 106 A Street, Benton, KY 42025; Robert Fitzgerald, (502) 527-8216


Rick's Hobby Farm, 2089 Park Rd., Hawesville, KY 42348; Rick Early, (502) 927-8527


Trio Hobbies & R/C, 216 Redmar Plaza, Radcliff, KY 40160; Maurice Johnson, (502) 351-7547


LOUISIANA

Al's R/C Store, 1529 Anita, Sulphur, LA 70663; Al Gaspard, (318) 625-5880 or (318) 437-8545


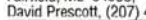
Baton Rouge Velodrome, 7122 Perkins Rd., Baton Rouge, LA 70815; Weldon Sharon, (504) 665-5616; open Sunday 10-4


Indy Speedway & Hobby, 3753 General DeGaulle Dr., New Orleans, LA 70131; Vince Sheetz, (504) 367-1891


Pontchartrain Hobby Shop, 3755 Pontchartrain Dr., Slidell, LA 70458; (504) 649-1199


MAINE

Clay Bowl R/C Hobbies, P.O. Box 61, Greene, ME 04236; Pat Cap, (207) 946-5003


R/C Speedway & Hobbies, 87 Main St., Fairfield, ME 04963; David Prescott, (207) 453-4588


MARYLAND

Cockeysville Astrodome Racers, 10854 York Rd. (rear), Cockeysville, MD 21030; Steve Balaz, (410) 666-2521


Countryside Raceway (portable), 406 Pamela Rd., Apt. C, Glen Burnie, MD 21061; M&J's Pormotional Entertainment, (410) 761-6196

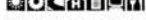

Doug's Raceway, 2935 Crain Hwy., Waldorf, MD 20601; Doug Moran, Jr., (301) 843-6220


Dusty Downs, 4665 Bethlehem Rd., Preston, MD 21655; Frank Show, (410) 673-2191


Hobby Town USA, 8223-11 Elliot Rd., Easton, MD 21601; Bill Dyke, (410) 920-9308

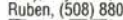

J.R.'s Race Place, 2935 Crain Hwy., Waldorf, MD 20601; James Radford, (410) 947-2766

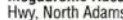

Outback R/C Race Club, Maiden Lane., Manchester, MD 21102; Randy or Bonnie Henry, (410) 374-2878


The Track, 16806 Oakmont Ave., Gaithersburg, MD 20877; Mimi Wong, (301) 417-9630


MASSACHUSETTS

C&C Hobby & Raceway, 562 Russells Mills Rd., So. Dartmouth, MA 02748; Charlie, (508) 997-4131

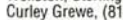

Hi-Tech Hobbies, 1681 Broadway (Rt. 138), Raynham, MA 02767; Ruben, (508) 880-5373


Megadrome Raceway, Rt. 8 Curran Hwy, North Adams, MA 01247; Bob Blanchette, (413) 743-7223


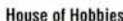
Northboro Speedway, 168 Main St., Rte. 20, Northboro, MA 01532; Bob Trimble, (508) 393-8087


MICHIGAN

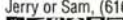
Down River R/C Racing Club, 1519 Oak St., Wyandotte, MI 48192; Jim, (734) 284-1560, or (734) 287-7405

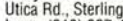

Freedom Hill R/C Raceway, 35372 Wellston, Sterling Heights, MI 48312; Curley Grewe, (810) 776-5483


Hobby Hub, 5859 M99, Diamondale, MI, 48821; Verne Goebble, (517) 337-9278 or (517) 351-5843


House of Hobbies, 2863 West Shore Dr., Holland, MI 49424; (616) 786-3686


JT Superspeedway, W. Golden Ave., Battle Creek, MI, 49015; Jerry or Sam, (616) 965-0116


Larry's Performance R/C's, 43665 Utica Rd., Sterling Heights, MI 48310; Larry, (810) 997-4840


MCRC Raceway, 4601 Page Ave., Michigan Center, MI 49203; Sam Sprang, (517) 787-9161


N.M.R.C.C. Raceway, Hobby Toy, Main St., Gaylord, MI 49735; Ed Schneider, (517) 732-3963

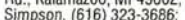

Northwest Michigan R/C Club 744 Munson Ave., Traverse City, MI 49686; Jim Ovaatt, (616) 947-6670

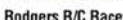

Raw Roots Race Tracks, 1/4 mile north on 152nd (off U.S. 31), West Olive, MI 49460; Roy Bennink (616) 399-9338, or Larry Welsh, (616) 786-2401


R&L Hobbies & Racing, 9782 Portage Rd., Kalamazoo, MI 49002; Rex Simpson, (616) 323-3686; fax (616) 329-1744


Rodgers R/C Raceway, 7463 Ridge Rd., Britton, MI 49229; George Rodgers, (517) 451-8301


Thumb Raceway, 3441 Main St., Marlette, MI 48453; Jim Wilson, (517) 635-7848


USA Raceways, 6083 Dixie Hwy., Bridgeport, MI 48722; Dave Killingsworth, (517) 777-7USA


Vicksburg Off-Road R/C Raceway, 50201 Silver St., Vicksburg, MI 49097; Tim, (616) 323-7963


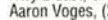
Village Hobbies-n-Crafts, 195 N. Elm, Hesperia, MI 49421; Alan or Fran, (616) 854-1374

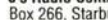

Village R/C Raceway, Prairie Ronde St., Decatur, MI 49045; Chuck Nolke, (616) 423-7878


West Michigan R/C Racers Club, 814 E. Railroad St., Hastings, MI 49058; Doug, (616) 948-2287 or Pat, (616) 945-3873


MINNESOTA

Duey's Hobbies & R/C Raceway, 6600 Cahill Ave., Inver Grove Heights, MN 55076; Duey Carlson, (612) 450-1721

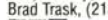

Grand Rapids R/C Speedway, 2209 Hwy 2 East, Grand Rapids, MN 55744; Aaron Voges, (218) 326-6751


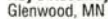
J's Radio Control Race Park, Rte. 2, Box 266, Starbuck, MN 56381; Jay Campbell (320) 239-4827


Minn-E-Golf & Hobby, 9100 Park Ave., Elk River, MN 55330; (612) 441-8365


Northwoods Hobby Raceway, 2635 Hwy 25 North, Brainerd, MN 56401; Tom Grogg, (218) 829-9257


Paul Bunyan Raceway, Rte. 1, Box 468, Bemidji, MN 56664; Brad Trask, (218) 243-2749


Ray's Raceway Park, 105 3rd Ave. NE, Glenwood, MN 56334; Dan Winter, (320) 634-5246


R/C Racing World, 235 Main Ave. North, Harmony, MN 55939; Mark McKay, (507) 886-5931 or (507) 886-2224


Southside Speedway, 2241 Marion Rd. SE, Rochester, MN 55904; Kevin Guy, (507) 281-3233

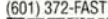

Time R/C Raceway, 20 West Lake St., Chisholm, MN 55719; RV, (218) 254-4321


Trackside Racing, 443 8th Ave. NW, New Brighton, MN 55112; Winton Ottelie, (612) 633-2112


Wild West R/C Speedway, 2822 Piedmont Ave., Duluth, MN 55811; Roger Deloach, (218) 727-6248


MISSISSIPPI

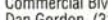
Joe McFadden Hobbies, 1619 51st Ave., Meridian, MS 39307; Joe McFadden, (601) 483-7000

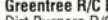

Small Cars Unlimited, 820 Cooper Rd., Jackson, MS 39212; (601) 372-FAST


MISSOURI

All Seasons Hobby, 152 O'Fallon Plaza, O'Fallon, MO 63366; Bob Daniels, (314) 281-8767

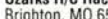

B&L Hobbies & Raceway, 2800 Anchor Dr., Park Hills, MO 63061; Bob Marler, (573) 431-9444


Fire Mountain Raceway, 8647 Commercial Blvd., Pevely, MO 63070; Dan Gordon, (314) 475-6449


Greentree R/C Racepark, St. Louis Dirt Burners R/C Club, Marshall Rd., Kirkwood, MO; (314) 831-2194


Ozark Mountain Speedway, Rt. #2 Box 50, H-Highway and County Rd. 31, Noel, MO 64854; Clayton Younker (417) 475-6222


Ozarks R/C Raceway, Hwy 13N, Brighton, MO 65781; Gene Rhodes or Ron Hawkins, (417) 742-4376 or (417) 742-7223


North Missouri Raceway, 223 Graves St., Chillicothe, MO; Billy Johnston, (816) 646-1120


Real Blue Vue Speedway, 12019 E. 47th St., Kansas City, MO 64133; Mark Randol, (816) 358-0238

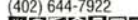

Real R/C Raceway, 24204 State Rt. 58, Pleasant Hill, MO 64080; Steve Hale, (816) 540-5584

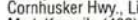

MONTANA

Stormer Raceway & Slot Motorplex, P.O. Box 126 Hwy. 2 East, Glasgow, MT 59230; (406) 228-4569


NEBRASKA

Goodyear Speedway and Off-Road, 4021 North 56th, Lincoln, NE 68510; Tom or Bob, (402) 464-5172


Hadar R/C Raceway, 55192 849th Rd., Norfolk, NE 68701; John Schoenauer, (402) 644-7922


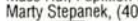
Hobby Town USA Raceway, N 1st St. & Cornhusker Hwy., Lincoln, NE 68508; Mark Kovarik, (402) 434-5056


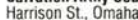
Mr. Bill's, 450 West 2nd St., Hastings, NE 68901; Bill J. Ries, (402) 462-4865


O.N.R.O.A.D., 3307 N. 58 St., Omaha, NE 68104; Cook Jacobs, (402) 556-8674

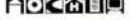

OTWG Carpet Raceway, 55129 849th Rd., Norfolk, NE 68701; John Schoenauer, (402) 644-7922


RC Motorsport Off-Road Raceway, 5600 Mass Rd., Papillion (Omaha), NE 68133; Marty Stepanek, (402) 593-6133


Salvation Army South Corps, 4032 Harrison St., Omaha, NE 68164; (402) 734-3414; fax (402) 734-3415


Siouxland R/C Car Association, 206 E. 13th St., South Sioux City, NE 68776; Jeff, (402) 494-1525


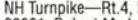
NEVADA

Dansey's Indoor R/C & Hobbies, 741 N. Nellis, Las Vegas, NV; David Lugo, (702) 453-RACE


NEW HAMPSHIRE

Axis Racing R/C Dragway, 4197 High St., Exeter, NH, 03833; Dan Peterson, (603) 659-4877

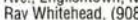

Economy R/C Speedway, 4 Maple St., Winchester, NH 03470; Harold Thomas, (603) 239-4482 or 239-6470

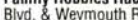

Robert's Railroad & Hobbies, 1335 1st NH Turnpike—Rt. 4, Northwood, NH 03261; Robert M. Jeffers, Jr., (603) 942-5193


RT 106 Racepark, 743 Clough Mill Rd., Pembroke, NH 03275; Douglas Graves, (603) 224-RACE


NEW JERSEY

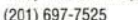
America's Hobby Center Inc., 18300 Tonnelle Ave., North Bergen, NJ 07047; John Many, (201) 662-0777


Ray's American Raceway, 142 Wilson Ave., Englishtown, NJ 07726; Ray Whitehead, (908) 446-3737


Family Hobbies Raceway, 3576 N.W. Blvd. & Weymouth Rd., Vineland, NJ 08360; Linda Vogel, (609) 696-5790


Jackson R/C Racing, P.O. Box 565, Christopher Columbus Blvd., Jackson, NJ 08527; Al Sodano, (732) 364-6422

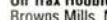

Jefferson Speedway, 5494 Berkshire Valley Rd., Oak Ridge, NJ 07438; (201) 697-7525


Jerry's Hobby Center & Raceway, 336 Rt. 22W, Greenbrook, NJ 08812; Jerry or Gary, (908) 752-6030


LBRA Track, 392 Warburton Pl., Long Branch, NJ 07740; (908) 222-5122


Millville R/C Oval, 114 N. High St., Millville, NJ 08332; William Denstoz, (609) 327-4640


Pit Stop Dragway, 100 Campus Rd., Totowa, NJ 07512; Kimberly Frank, (201) 956-7223


On Trax Hobbies, 1549 Rte. 70, Browns Mills, NJ 08015; Joseph DiGirolamo, (609) 735-0422


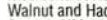
R/C Shag Arena, 690 Jendi Pkwy., Totowa, NJ 07513; Amber Beggel, (201) 956-7223


South Jersey Cost Controlled Racing, 25 Jackson Lane, Sicklerville, NJ 08081; Ray Murray, (609) 629-4809


The Race Place, 1151 Hwy. 33, Farmingdale, NJ 07731; John Fary, (908) 938-5215

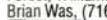

NEW MEXICO

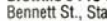
Charlie's Hobby Shop, 225 E. Idaho, Suite 11, Las Cruces, NM 88005; Kim or Chuck, (505) 541-1097


Meerscheidt R/C Raceway Park, Meerscheidt Recreation Center, Walnut and Hadley by BMX, Las Cruces, NM 88005; Robert Heinsen (505) 526-6856 or Jim Meerscheidt (505) 523-2995; email: MEERSCH@aol.com


NEW YORK

Barn Stormers, MD #1 Old Oxford Rd., Chester, NY 10918; Lou, (914) 469-8206


Brian's Off-Road Track, 1124 N. Forest, Williamsville, NY 14221; Brian Was, (716) 633-8155


Brownie's Pro & Sport Hobbies, 124 Bennett St., Staten Island, NY 10302-1426; John Brown, (718) 727-2194


Bruckner Racing, 2908 Bruckner Blvd., Bronx, NY 10465; Thomas Baffers Sr., (800)-288-8185

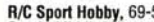

Long Island Raceway, 168 Broad Hollow, Farmingdale, NY 11735; James, (516) 845-7223

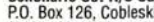

Performance Plus Radio Control Speedway/The Hobby House, 1141 1/2 Jones & Gifford Ave., Jamestown, NY 14701; (716) 488-1772


P.R.O. Speedway, 5 Washington St., Cattaraugus, NY 14719; Marc Pritchard, (716) 257-3101

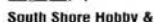

Radio Hill Raceway, 1219 Shannon Corners Rd., Dundee, NY 14837; Bill Brewer, (607) 243-8641


Rampage R/C, 27 Fuller Lane, Hyde Park, NY 12538; Brian Walker, (914) 229-1379; (914) 229-2456


R/C Competition Corner, 2413 Brewerton Rd., Mattydale, NY 13211; Lori and Cos Cirriello, (315) 455-8718


R/C Sport Hobby, 69-57 Juniper Blvd. South, Middle Village, NY 11379


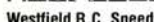
Schoharie Co. R/C Car Club, P.O. Box 126, Cobleskill, NY 12043; (518) 922-6982


Southern Tier Raceway, 88 Paige St., Owego, NY 13827
 Anita Harding, (607) 687-5395


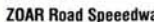
South Shore Hobby & Raceway, 464 East Main St., Patchogue, NY 11772; Benny or Bonnie, (516) 758-5567


Tri County Remote Control Car Club, 33 West Decker St., Johnstown, NY 12095; Jim Sprouse, (518) 762-8884


Tri-state Area Radio Control Model Auto Club (TARMAC), 2830 Mountain View Rd., Poughkeepsie, NY 12603; Todd (914) 342-5409; tracksite (914) 454-8276

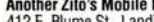

Walt's Hobby, 2 Dwight Park Dr., Syracuse, NY 13209; (315) 453-2291


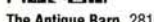
Westfield R.C. Speedway, 27 Clark St., Westfield, NY 14787; John or Jared Lindstrom, (716) 326-2339; 716-326-2309

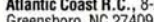

Whitestone, 30-56 Whitestone Expy. (Dept. of Motor Vehicles), Flushing, NY 11374; Rudolf Ardilla, (718) 966-6155


ZOAR Road Speedway, 15318 Armes Ct., Gowanda, NY 14070; David & Gordon Ackler, (716) 532-9463


NORTH CAROLINA

A&J R/C Models, 2051 Anthony Rd., Burlington, NC 27215; Jerry Loye or Andrea Thompson, (910) 227-4556; fax (910) 227-1001


Another Zito's Mobile MASCARR Inc., 412 E. Blume St., Landis, NC 28088; Carmen Esposito or Pat Youngerman, (704) 451-3293


The Antique Barn, 2810 Forest Hills Rd., Wilson, NC 27893; (919) 237-6778


Atlantic Coast R.C., 8-A Lockhead Ct., Greensboro, NC 27409; Charlie Higgins or Harry Johnson (910) 664-1277


Badin Shore Raceway, 1730 Jackson Lake Rd., High Point, NC 27263; Jimmy or Tim Martin, fax (910) 431-6407

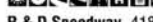

C/C Hobby Speedway, 8358 U.S. Hwy. 220 Bus. N., Randleman, NC 27317; Steve & Mary Cox, (910) 495-3482


C&H Raceway, 1400 N. Cannon Blvd., Kannapolis, NC 28083; Camera & Hobby Shop, (704) 933-5321


C/W R/C Speedway, 1297 Charlotte Hwy., Asheville, NC 28730; Billy or Tim, (828) 684-0061

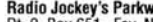

Carolina Dragway, 907-D Warsaw Rd., Clinton, NC 28328; (910) 592-4569

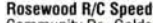

Chatham R/C Raceway, 326 Reno Sharpe Store Rd., Bear Creek, NC 27207; Dwight Fields, (919) 898-2991


Green Flag RC Raceway, 107 Harley Rd., Wilmington, NC 28401; Mike McLemore, (910) 397-0676 or (910) 452-1620


R & D Speedway, 418 Main St., Tarboro, NC 27886; John Dupree, (919) 823-2294


Ride & Slide R/C Raceway, 5319 Yackin Rd., Fayetteville, NC 28303; Bill Culbertson, (910) 867-4202


R&J Off-Road Racing, 6172 Blalock Rd., Lucama, NC 27851; Robert Williams, (919) 239-0853


Radio Jockey's Parkway, "RJ's," Rt. 9, Box 651, Fay, NC 28301; Tony Starling, (910) 486-4820


Rosewood R/C Speedway, 651 Community Dr., Goldsboro, NC 27530; Glenn Elam, (919) 731-4734


Southern RC Motorsports Club, Hwy. 17S., Charlotte, NC 28459, P.O. Box 1651; Mark Whitt, (910) 754-4902 or Eddie Ferster, (910) 754-8528


Ultratrac, 5505 Palmers Branch, Leland, NC 28451; Mike Williams, (910) 313-0350


NORTH DAKOTA

Hacienda Hills Speedway, 20 Hacienda Hills, Minot, ND 58701; Kenny Duchscherer, (701) 839-4419


Northern Mini Racers, 1000 36th St. SE, Minot, ND 58702; Mike, (701) 838-5818


River City R/C, 2714 Main Ave., Fargo, ND 58103; Chris Hughes, (701) 235-1272


OHIO

American Ohio Sprint Car, 1708 Empire Rd., Wickliffe, OH 44092; Gary Waldhelm, (440) 944-9966


CORCAR/Sams Club, 128 Amity Rd., Galloway, OH 43119-8732; Bill Stevenson, (614) 870-7159

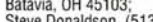

Columbus R/C Racing Club (C.R.C.R.C.), Franklin County Fairgrounds, Hilliard, OH 43026; Jeff Crowell, (614) 236-1783

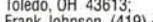

D&D Hobby Center, 1344 Lexington Ave., Mansfield, OH 44907; Eric Radio (419) 756-9771


D&J R/C Raceway, 801 W. Market St., Orrville, OH 44667; Don Yoder or Mark Nussbaum, (330) 682-4266


Dirt Trax, 2206 13th St. NE, Canton, OH 44705; Dan Mauger, (330) 833-3091


Full Throttle Raceway, 600 Mt. Moriah Dr., Cincinnati, OH 45255; Greg Roshan, (513) 943-9009


Fun for All Raceway, 675 College Dr., Batavia, OH 45103; Steve Donaldson, (513) 732-0440


Glass City Radio Control, 2620 Ivy Pl., Toledo, OH 43613; Frank Johnson, (419) 472-1286


Greentown R/C Raceway, 3353 Perrydale, Greentown, OH 44630; Chuck Lambert, (330) 364-6585


Hobby Shop Raceway, 2096 Miamiburg, Centerville Rd., Centerville, OH 45459; The Hobby Shop, (937) 436-6161


Hobby World, 3499 SR 59, Ravenna, OH 44266; Tom Fry, fax (330) 296-0894


Lafferty R/C Raceway, Box 153, 70228 Hurrah St., Lafferty, OH 43951; Chris Christman, (614) 968-4818


Lakes Hobbies, 3425 Manchester Rd., Akron, OH 44314
 Roy Spencer, (330) 645-6912


Medina R/C Raceway, 754 N. Court St., Medina, OH 44256; Bill Aholt, (216) 723-0255

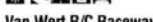

Mid American Raceway, 13150 Airport Hwy., Swanton, OH 43558
 Bill or Chuck, (419) 475-9459


Nothing But Air R.C. Track, 34632 True Rd., Logan, OH 43138
 Gary Lloyd, (740) 385-0288


Scooters Hobby Hut, 234 Robbins Ave. #D, Niles, OH 44446; Dave "Scooter" Evans, (216) 544-9411


Shiray's Hobby & RC Raceway, 19930 State Route 117, Waynefield, OH 45896; Ray Zimmerman, (419) 568-8055


TARCAR, 7216 Nebraska Ave., Toledo, OH 43617; Bill Bridges, (419) 826-3859


Tri-State R/C Auto Racers, Joyce Park, Hamilton, OH, 45011; Ernie Bauhoffer, (513) 528-2052


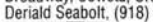
Van Wert R/C Raceway, 144 E. Main St. (above Hoverman Music), Van Wert, OH 45891; Mark Davis, (419) 232-2112


Y-City Hobby & Speedway, 120 S. 6th St., Zanesville, OH 43701; Kevin McKenna, (614) 455-3025

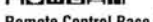

OKLAHOMA

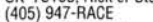
Adams Creek R/C Speedway, 5207 S. 194th E. Ave., Broken Arrow, OK 74014; John Beighle, (918) 355-1416


Competition R/C, 100 SE 89th, Oklahoma City, OK 73149; James or Louise Brown, (405) 634-0809


Coweta Hobby & Speedway, 310 S. Broadway, Coweta, OK 74429; Derald Seabolt, (918) 486-3948


R/C Speedway, 1401 N. Vanburan, Enid, OK 73701; Sean or Jessica Hillery; (405) 237-5504


Remote Control Race Course, 400 S. Vermont Ave., Ste. 104, Oklahoma City, OK 73108; Rick or Steve, (405) 947-RACE


Wild Country Speedway, 127 South Main, Porter, OK 74454; Charles McCollough, (918) 685-0372 or (918) 687-1686


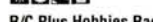
OREGON

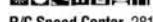
Competition Racing Association, 17941 NE Gleason, Portland, OR 97230; Mark Taylor, (503) 761-1334

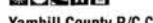

D.I.R.T. (Diamond International Race Track), 65540 73rd St., Bend, OR 97701; Daleyne and Edward Gletzt, (541) 388-2932 or 1-800-475-6040, ext. 777


Junior Vehicle Speedways, 3634 Table Rock Rd., Medford, OR 97501; (541) 664-7810


Pit Stop Hobby, 634 N. Coast Hwy., Newport, OR 97365; Richard Wood, (541) 265-2825


R/C Craze Speedway, 300 Ashland Lane, Ashland, OR 97520; Shawn Lazareff, (541) 482-4786


R/C Plus Hobbies Raceway, 1857 25th St. SE, Salem, OR 97302; Ron Smith, (503) 364-9188


R/C Speed Center, 2810 N. Pacific Hwy., Medford, OR 97501; Gene and Betty Jean Skelton, (541) 779-8298


Yamhill County R/C Car Club, 722 Morgan Ln., McMinnville, OR 97128; Larry Rucker, (503) 472-7234


PENNSYLVANIA

A&D's Bumps & Jumps, RR7, Box 7395C, Stroudsburg, PA 18360; Dan Ambrosio, (717) 424-1750

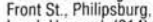

A&E Raceway, Latrobe 30 Plz., Latrobe, PA 15650; Bruce Parker, (412) 539-7130

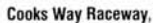

Bachman's Speedway & Hobbies, Box 306, Effort, PA 18330-0306; Jeffrey Bachman, (610) 681-5845


Benders Junction Speedway, 2300 Benders Dr., Bath, PA 18014; Gerald Wambolt Jr., (610) 759-0161


Brookville Hobby Shop, 170 Main St., Brookville, PA 15825; Mark Tonell, (814) 849-7385


CEB Motors R/C Div., 5743 Molly Pitcher Hwy., Marion, PA 17235; Charlie Booze, (717) 375-4635


Columbia Racing Association, 128 N. Front St., Philipsburg, PA 16866; Lurch Hammal, (814) 342-7114


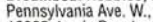
Cooks Way Raceway, Cook's Way, Mt. Pleasant, PA 16666; Bob Rhodes, (412) 547-5719


Courtview Raceway, 20 S. Main Street (lower level), Washington, PA 15301; Aaron Stimmel Jr., (724) 225-4302


Cressona Mall Speedway, Rt. 61, Pottsville, PA 17901; (717) 385-3506

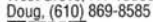

DC Ultra Trax, 13 York Rd., Wycombe, PA 18974; David Cowan, (215) 672-5200

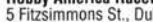

Dreamboat Hobbies, 2810 Pennsylvania Ave. W., Warren, PA 16365; Louie Dussia, (814) 723-8052


Fantasy RC's and Hobby, 2315 W. 12th St., Erie, PA 16505; Frank Francis, (814) 453-6337


Hipkin's Hobbies, 402 W. Avondale Rd., West Grove, PA 19390; Doug, (610) 869-8585


Hobby America Raceway, 5 Fitzsimmons St., Duke Center, PA 16729; Dan or Mike Coast, (814) 966-3765


Koontz's Home & Hobby Center, 1205 Hoover St., Pittsburgh, PA 15204; (412) 331-3866


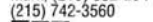
Kranzel's R/C Raceway & Hobbies, 415-B Bosler Ave., Lemoyne, PA 17043; David or Stuart Kranzel, (717) 737-7223


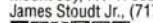
Little Plum R/C Hobbies, RR 1 Box 330, Lock Haven, PA 17445; Larry Duck, (717) 769-1984


Lugnut Raceway, 1713 Bethlehem Pike, Hatfield, PA 19440; Bill Henning or Kathy Anderson, (215) 822-5831


Marshall's R/C Raceway, RR 4, Box 640, Honesdale, PA 18431; Bill or Dot Marshall, (717) 729-7458


The Mushroom Bowl, 960 W. Cypress St., Kennett Square, PA 19348; Bruce or Drew, (610) 444-1850


Pinion Twisters, 3M Plant, Green Ln. and Mitchell, Bristol, PA, 19007; Mark, (215) 632-2344 or Tony, (215) 742-3560


Pit Stop Hobbies, 262 W. Main St., Mount Joy, PA 17552; James Stoudt Jr., (717) 653-6222


Prop & Wheels Raceway, 139 W. Broad St., Tamaqua, PA 18252; Gil Walters, Prop & Wheels Hobbies, (717) 668-2288

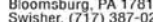

The Raceway at River Junction, 1216 4th St. (behind cemetery), Beaver, PA 15009; (412) 728-5571


RC Ave. Raceway 324 McKinley Ave., Latrobe, PA 15650
 Scott Smith, (412) 537-5501


RC Outfitters RCO Raceway 519 Broadway, Hanover, PA 17331; Chris Shaffer, (717) 633-9490


R/C Pro Speedway, Millville Rd., Bloomsburg, PA 17815; John Swisher, (717) 387-0266; fax (717) 387-9337


R/C Pro III, 910 Chestnut St., Coal Twp. (Shamokin), Shamokin, PA 17866; John Swisher, (717) 648-7763


Riverside Raceway, PA Ave. W & Hickory, Warren, PA 16365; Jeff, (814) 723-4211


Hacienda Muñoz R/C Track, Carr. #14, Juana Diaz, PR 00795; (809) 837-7083



RHODE ISLAND

SK Hobbies Inc., 15 Carl St., Johnston, RI 02919; Slim or Keith, (401) 453-1440



Tri-State R/C Raceway, 205 Hallene Rd., Warwick, RI 02886; Raymond Dean, (401) 738-4908



SOUTH CAROLINA

Extreme R/C Raceway, 5976 Grace Lane, Myrtle Beach, SC 29577; Kevin Bullock, (803) 236-2083



The Grove Racing Center, 939 S. Anderson Rd., Rockhill, SC 29730; Mike Durham or Don Faris, (803) 327-4121



Hobbies and More, 1570 S. Main St., Darlington, SC 29532; Jerry Pollard, (803) 393-0355



J&M R/C Hobbies, 5341 Dorchester Rd., Evanston Plaza, N. Charleston, SC 29418; Mike Smith, (803) 552-9449



Midway Hobby and Raceway, 707 Sulphur Springs Rd., Greenville, SC 29611; Allen A. Dodson, (864) 246-6335

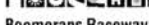


ORA Atomic Racing Facility, 373 Boyd Pond Rd, Aiken, SC 29803; Bill Jackson, (706) 855-0846 or (803) 642-0314

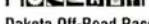


SOUTH DAKOTA

Action R/C Raceway, 107 N. Main, Mitchell, SD 57301; (605) 996-6895



Boomerangs Raceway, 105 N. Main, Hartford, SD 57033; Ed Smithback, (605) 528-7345



Dakota Off-Road Racers, 2989 W. Br. Co. 12, Aberdeen, SD 57401; (605) 226-0604



Goldtrax Raceway, 409 E. High, Lead, SD 57754; Steve Brown, (605) 584-2355



K&B Speedway, 27283 SD Hwy. #115, Harrisburg, SD 57032; Mike Kosetin, (605) 743-2582



R/C Action Raceway, SE Corner at 484th & Hwy. 38, Sioux Falls, SD 57105; Brian Cox, (605) 373-0511



TENNESSEE

D&M's Downtown Raceway, 2703 U.S. Hwy. 41S, Maryville, TN 37033; (423) 681-8919



Hillside R/C Raceway, 4194 Oakhill Rd., Dayton, TN 37321; John and Rusty Tipton, (423) 775-4739



Hobby Town USA, 2000 Mallory Lane, Franklin, TN 37067; Bobby Mills, (615) 771-7441



Lawson Raceway, 152 Joel Rd., Oliver Springs, TN 37840; Anthony Lawson, (206) 815-0379



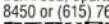
Machine-Head Straits, 938 Grandmere Rd., Lawrenceburg, TN 38464; Larry and Eliane Sanders, (615) 762-6630



MSA R/C Racing, Rt. 12 Box 489 B, Crossville, TN 38555; D.R. Findley, (615) 456-0027



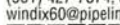
Sparta Raceway Park, 32 N. Main St., Sparta, TN 38583; Carl (Buddy) Elrod, Rt. 5 Box #652, Sparta, TN 38583; (615) 836-8450 or (615) 761-3407



Tnt Raceway, 643 Loop Hollow Rd., New Tazewell, TN 37825; Cliff Swett, (423) 626-9065 or (423) 869-8942



W.O.W. Raceway, 59 Luray Rd., Beech Bluff, TN 38313; Kelly Bean, (901) 427-7874; email: windix60@pipeline.com



TEXAS

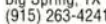
215 Speedway, 1814 County Road 215, Abilene, TX 79602; Clyde Gardner, (915) 673-2351



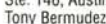
Big Mike's R/C Raceway, 1405 W. Cotton St. (behind the Locker Room), Longview, TX 75604; (903) 297-7814



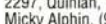
Comanche Trail RC Park, City Park, Big Spring, TX 79720; Allen Nichols, (915) 263-4241



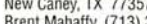
Command Hobbies, 6929 Airport Ste. 146, Austin, TX 78752; Tony Bermudez, (512) 458-2324



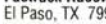
Drycreek Raceway, 5903 Co. Road 2297, Quinlan, TX 75474; Micky Alphin, (903) 883-4060



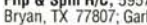
Eastex Raceway, 45000 Hwy. 59 N., New Caney, TX 77357; Brent Mahaffy, (713) 399-9777



Fastrack Raceway, 301 Edith Drive, El Paso, TX 79924; Hector Gonzalez, fax (915) 779-4524



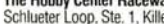
Flip & Spin R/C, 5957 Jones Rd., Bryan, TX 77807; Garland Crabb, (409) 822-7311



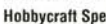
Hal's Hobby Raceway, 1440 Bessemer, El Paso, TX 79936; (915) 591-2213



The Hobby Center Raceway, 4104 Stan Schlueter Loop, Ste. 1, Killeen, TX 76543; Lawrence Remick, (817) 690-7311



Hobbycraft Speedway, 819 N. Main St., Corsicana, TX 75110; Keith Hoffman, (903) 872-6761



Hobbytown USA, 7676 FM 1960 W., Houston, TX 77070; Fred Pfafman, (713) 955-7097



Hobbytown USA, 999 E. Basse Rd., Suite 177, San Antonio, TX 78209; Joe Sena or Clark Baisdon, (210) 829-8697; fax (210) 829-8707



Indy R/C World, 220 Saturn Rd., Garland, TX 75041; Steve Webster, (214) 271-4844; fax (214) 271-4502



Keyser's Hobbies, 1643 Texas, College Station, TX 77840; Bill Bennett, (409) 693-8095



MBRC Off-Road Raceway, 204 D&E Valley Lane, Kennedale, TX 76133; (817) 292-5055



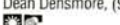
North Houston Speedway, 11847 Spears Rd., Houston, TX 77067; Bob or Carol Hillin, (713) 872-2471



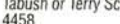
North Texas 1/2 Scale Association, 3905 Sandia, Plano, TX 75023; Dean Densmore, (972) 519-0324



Performance Raceway, 1106C Witte Rd., Houston, TX 77055; Jorge Tabush or Terry Schmid, (713) 464-4458



Rev It Up Raceway, 3076 Keller Rd., Smithville, TX 78957; Rev. Alton T. Edwards, (512) 360-5443



Rick's R/C Raceway, 23B Scenic Loop, Boerne, TX 78000; Rick, (210) 981-2245 or Rich, (210) 590-1805



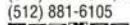
Rough Country, 905 Jacksboro Hwy., Wichita Falls, TX 76701-5310; Robert Kerr, (817) 322-2453



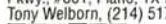
Star/Car Raceway, 5802 Patton St., Corpus Christi, TX 78415; Glen Stead, (512) 949-8525; Race Hotline, (512) 881-6105



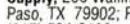
T&T Eagle, 161 W. Spring Creek Pkwy., #601, Plano, TX 75023; Tony Welborn, (214) 517-0562



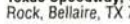
Terminal Velocity R/C Raceway & Supply, 200 Wallington, Ste. 223, El Paso, TX 79902; Rick or Frank, (915) 534-9198



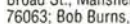
Texas Speedway, 6707 Chimney Rock, Bellaire, TX 77401



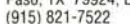
Tiger's Den R/C Speedway, 702 E. Broad St., Mansfield (DFW), TX 76063; Bob Burns, (817) 477-5513



T.O. Offroad Raceway, 6236 Quail, El Paso, TX 79924; Efrén Saenz, (915) 821-7522



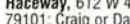
Triple Jays R/C Raceway, Rte. 4, Box 720, Allen, TX 75002; Jeffrey Jay Johnson, (972) 562-7967



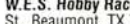
Warehouse Radio Controlled Raceway, 612 W. 4th St., Amarillo, TX 79101; Craig or Darren Waddell, (806) 374-6485



W.E.S. Hobby Race, 980 S. Fourth St., Beaumont, TX 77701; Edmond Richards, (409) 839-4929



Wild Bill's Raceway, 535 E. Shady Grove, Irving, TX 75060; Lynn Morgan or Tom Nix, (414) 438-9224

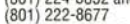


UTAH

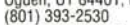
Intermountain R/C Raceway, 8481 W. 2700 S., Magna, UT 84044; David Mott, (801) 250-8303



Payson R/C Raceway, 955 South Main, Payson, UT 84651; Sue Wood, (801) 224-3852 and Lasca Wood, (801) 222-8677

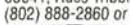


WOR Raceway, 3170 Brinker Ave., Ogden, UT 84401; Brian Worton, (801) 393-2530

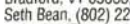


VERMONT

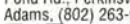
Barre Town R/C Club, 14 South Main St., Wall St. Complex, Barre, VT 05641; Russ Tribble or Pete Perreault, (802) 888-2860 or (802) 476-9458



Bradford R/C Racing, Main St., Bradford, VT 05033; Seth Bean, (802) 222-9674



Stoughton Pond Raceway, Stoughton Pond Rd., Perkinsville, VT 05151; Rick Adams, (802) 263-9321



VIRGINIA

Bob's Hobbies & Raceway, 7422 Brandywine Dr., Mechanicsville, VA 23111; Bob, (804) 746-2758



Brown Brothers Hobbies, 924 North Main Street, Dumfries, VA 22026; Joel or Bob Brown, (703) 221-5746



Cooper's R/C Race Center, 4000 Sago Rd. (969), Chatham, VA 24531; Norris Cooper, (804) 724-7342 or (804) 724-4182



DRCW Raceway, Debbie's RC World, 2200 Commerce Parkway, Virginia Beach, VA 23454; Les Modlin, (757) 340-6681



Gloucester Scale Hobbies, 2352 George Washington Memorial Highway, Hayes Plaza, Hayes, VA 23072; Rob Thein, (804) 642-3484



Hobby Hangers Speedway, 14014 D Sullyfield Cir., Chantilly, VA 20151; Kwang or Billy, (703) 631-8820



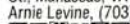
The Hobby House, 116 Edds Ln., Sterling, VA 20165; Oppie, (703) 444-0333



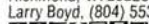
KC's Radio Control & Repair, Rt. 4, Box 312, Trents Ferry Rd., Lynchburg, VA 24503; Curtis or Kim Wright, (804) 384-8596



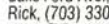
Olde Towne Hobby Shoppe, 9105 Center St., Manassas, VA 22110; Arnie Levine, (703) 369-1197



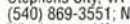
Race World Hobbies, 6102 Lakeside Ave., Richmond, VA 23228; Larry Boyd, (804) 553-8040



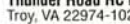
Roadmasters/ Rick's Hobbies, 12201 Balls Ford Ave., Manassas, VA 22110; Rick, (703) 330-6833



Shamroc Raceway, 106 Chevrolet Place, Stephens City, VA 22655; Scott Janow, (540) 869-3551; Note: track is located in Winchester, VA



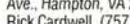
Thunder Road RC Racing, P.O. Box 1022, Troy, VA 22974-1022; James Palmer, (804) 589-8174



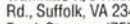
The Toteyard, Route 1, Box 235A, Dayton, VA 22821; (540) 828-3476



Trackside Hobbies, 1920 E. Pembroke Ave., Hampton, VA 23663; Rick Cardwell, (757) 723-4170

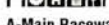


Trainlano R/C Racing, 5661 Shoulders Hill Rd., Suffolk, VA 23435; Frank Stevens, (757) 488-5454

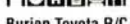


WASHINGTON

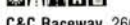
Allie's, 108 South K St., Aberdeen, WA 98520; (360) 533-6638



A-Main Raceway, 14011 NE 3rd Ct., Vancouver, WA 98685; Monty Coleman, (360) 571-8404



Burien Toyota R/C, 15025 1st Ave. South, Seattle, WA 98148; Ray Meek, (800) 654-6456



C&C Raceway, 266 Lind Ave. NW, Revton, WA 98055; Charles Lakin, (206) 227-5167



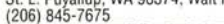
Cedardale Raceway, 1673 Cedardale Road, Mount Vernon, WA 98273; Joe Madonia, (360) 659-0072; e-mail: getchell@halcyon.com



Four Season R/C Racing, 2941 Steater Kinney Rd. NE, Olympia, WA 98506; Gary and Sharon Brown, (360) 491-2430



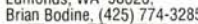
Hale's R/C Raceway Park, 10611 136th St. E. Puyallup, WA 98374; Walt Hale, (206) 845-7675



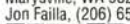
Hannegan Speedway, 4212 Hannegan Rd., Bellingham, WA 98225; Dana Hoggarth, (360) 734-4090



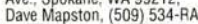
Raceway Hobbies, 188 Sunset Ave. S., Edmonds, WA 98020; Brian Bodine, (425) 774-3285



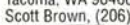
Schmidt's Auto Parts, 10305 Old Hwy. 99, Marysville, WA 98271; Jon Failla, (206) 653-8838



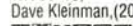
Spokane Indoor Raceway, 6422 E. 2nd Ave., Spokane, WA 99212; Dave Mapston, (509) 534-RACE



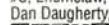
Tacoma R/C Raceway, 6305 6th Ave., Tacoma, WA 98406; Scott Brown, (206) 565-1935



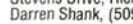
Tearor Raceway, Fantasy World Toy and Hobby, 7901 S. Hosmer, Tacoma, WA 98408; Dave Kleinman, (206) 473-6223



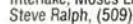
Ultimate R/C Raceway, 907 Cole St. #3, Enumclaw, WA 98022; Dan Daugherty, (360) 802-2388



West Coast Hobby & Raceway, 2239 Stevens Drive, Richland, WA 99352; Darren Shank, (509) 375-4995



Zep's Hobbies & Raceway, 530 Interlake, Moses Lake, WA 98837; Steve Ralph, (509) 765-8191



WEST VIRGINIA

Burr-Fab Raceway, 90 Davis St., West Union, WV 26456; Mark Travis, (304) 873-2487



Fulton's R/C Raceway, 2646 Chapline St., Wheeling, WV 26003; James Fulton, (304) 233-5355



Left Turn Hobbies, 100 Saco Ln. (by Post Office), Glen White, WV 25849; Stretch, (304) 255-3930



Race Zone, Hopewell Rd., Rt. 8, Box 343A, Fairmont, WV 26554; Joe Clutter, (304) 368-1000



WVRC R/C Club,

Xtreme Hobbies Raceway, 2724 Powder Basin, Gillette, WY 82718; Krieg Balls, (307) 682-6077



ARGENTINA

Club A. Velez Sarsfield, Av. J.B. Justo 9000, C.P. 1408, Buenos Aires; Jorge Herrero, 54-01-658-5851



AUSTRALIA

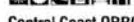
A.C.T. Model Car Racing Club, offroad track—Wanniassa Raceway, Hyland Place, Wanniassa A.C.T.; indoor track—Epic Complex, Northbourne Ave., Canberra North A.C.T.; Gary Davey, 61-6-2871411



Aubry R/C Car Club, Aubry Showgrounds, Aubry, NSW 2640; Ron Langman, 060-247-128



Canberra Off-Road Model Car Club, Goyder St., Narrabundah, ACT 2604; Graham Brown, 61-6-241-3070



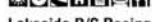
Central Coast ORRC, EDSACC Sports Complex, Bateau Bay, N.S.W. Australia 2261; Peter J. Knight, 61-43-693-698



Fast n' Fun, 250 Potreath Rd., Bellbrae West, Torquay, VIC 3228 Australia; Stephen Charr, (613) 5266 1550 or (613) 5266 1556; fax (613) 5266 1556



Illawarra RCECC, Croome Sporting Complex, Albion Park Rail, NSW 2527; Mel or Andrew, 042-714-683



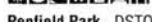
Lakeside R/C Racing Car Club, Hollywood Dr., Lansvale, NSW 2166; R. Bartolozzi, 62-2-907-9800



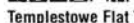
Melton Electric Circuit Car Association, Safeway Car Park, Corner High St. and Coburns Rd., Melton, VIC 3337; Arthur Joslin, 61-3-9747-8805



Northern Districts Model Rally Club, Inc., Rear Stanford Centre, 16 Stanford Way, Malaga, Western Australia 6066; G. Thirlwell, 61 (9) 249 3855; fax 61 (9) 249 4778; email tony@ois.com.au



Penfield Park, DSTO Complex, Salisbury, Adelaide, South Australia 5108; Trevor Unsworth, (618) 8289-5010



Templestowe Flat Track Racers, Templestowe Reserve, Corner of Porter St. and Williamsons Rd., Templestowe, Melbourne, Victoria 31066; Renato Benci, 61 (3) 9553 4625



Wodonga R/C Car Club, 11 Murphy St., Wodonga, VIC 3690; Ron Langman, 61-60-247-128



BELGIUM

ATR-Alka-Tele-Racing, 3570 Stationstraat 21, Aiken Limburg; 0032-11-25-49-03



Cartroubles Indoor Buggy Track, Jan Moonsstraat 52-56, 2160 Wommegem, Belgium; Guy Ermes, 32-3-326-51-15; fax 32-3-326-51-01



MBV-Kampenhout, Teniersin 28, Kampenhout 81910, Belgium; Frank Mostrey, phone and fax 0-16-65-75-18



MRCZ, Centrum, De Burg, Belgium; Montie, 75-71-63



Model Racing Club Oudenaarde, Scheldelcant, 9700 Oudenaarde, Belgium; A. Chanterie, 32-55-31-36-48; fax 32-55-30-19-12



R.C.R., Peilstraat 43, Retie 2470, Belgium; A. Eelen, phone and fax 32-14-379685



BRAZIL

Amoc Cassociacao de Modelismo B. Camborio, Junto ao Par Que Ecologico de Pal. Camborio, Bal. Camborio, S.C. 88.330-000; Leo Cesar, (047) 366-0001



Brasilia R/C Motor Circuit, Estacionamento do Estadio Mane Guarrichina, Brasilia, DF 70000, Brazil; Alexandre (Alex), 55-061-273-7205



C.A.A.R. Curitiba Associacao de Automodelismo Radiocontrolado, Rua Theodoro Makioka, n. 2300 Santa Candida, Curitiba, PR Brazil, 82650-530; Ronaldo Assumpcao, 55-41-354-2804



Electric Car Club R/C Santos, Av. Bernardino de Campos, 227, Santos, SP, Brazil, 11065-001; Estevam or Arnaldo, 55-013-232-2536



Hobby Center, SOS 210 B.H. Apt. 204, Brasilia, DF-Brasil 70.273; 061-242-0488



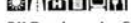
Hobby Planet Racing Club, Rod Dom Pedro 1, KM 1315, Campinas, Sao Paulo, Brasil 13091901; Daniel, Helio, Luciano, 019 258 2768



Jungle Drive, Rua Alberto Maranhao, No. 219 Icha do Rio de Janeiro, 21940-490; Paulo Brito (021) 396-0851 or (021) 393-7449



MP Raceway, AV. Nacoes Unidas, 6815 Lapa, Sao Paulo; Gerd Heitrotter, 55-11-9819039; www.hpraceway.com.br



Off Roaders, Av. Guillerme Dummont Villars, 317, Sao Paulo, CEP 05640; Waldir Iepci, (055) 011-260-5628; fax (055) 011-831-4931

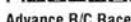


Way of R/C Off-Road Cerrado, Rua Paraiba 1323, 1st floor, Belo Horizonte, Minas Gerais; Claudio T. Corrêa, (031) 227-6111, fax (031) 227-6869



CANADA

Action Weelz, 462 Turcotte, Vanier, Quebec, G1M 1R6; Regent Tardif, (418) 527-5756



Advance R/C Raceway, 4181 Sheppard Ave. E, Scarborough, Ontario M1S 1T3; Albert Lau, (416) 321-8377



A&J Toronto R/C Raceway, 24 Main St., Building B, Unionville, Ontario L3R 2E4; (905) 305-1479



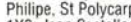
The All New R.C. World, 2633 Hwy. #6, Mt. Hope, Hamilton, Ontario L0R 1W0; Dave, (905) 765-2301, Larry, (905) 333-3297 or Brian, (519) 752-0044



ATN, Auto Teleguide Nicolet, 2000 Rue Paul Hubert, Saint-Jean - Baptiste-de-Nicolet, Quebec J3T 1E5; Louis Durand, (819) 293-6097



Auto Sprint, 6065 Des Grands Prairies, St. Leonard, Quebec H3G 2R6; David Kalayjian, (514) 287-3503



Circuit J.C., 1283 Chemin, St. Philipe, St Polycarpe, Quebec J0P 1X0; Jean Castellon, (514) 265-3675



Circuit Pepsi, Centre de Location, 37 duRoi, Sorel, Quebec; (514) 746-8828



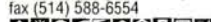
Circuit Plessis, 260 Rang 9 Ouest, Plessisville, Quebec G6L-2Y2, (819) 362-3743



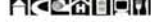
Circuit R/C Pro, 1500 Chemin Sullivan, Vaid'Or, Quebec, J9P 1M1; R/C Modeler Plus, (819) 874-3918



Circuit Teleguide St. Roch, 363-B St. Charles, St. Roch De L'Achigan, Quebec J0K 3H0; (514) 588-4254, fax (514) 588-6554



Circuit Teleguide Grand Prix, 9600 Ignace, Ste. C. brossard, Quebec J4Y 2R4; (514) 444-1286



Club Avati, 244Jules-Richard, Deauville, Quebec J1N 3; Daniel Vanier, (819) 864-6262



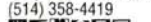
Club RCSTI, 44 Rue Holliday, Sept-Iles, Quebec G4R; Sylvio Gerard, (418) 968-6575; Hobby Shop, (418) 962-6565



CRCCC, Box 309, Clinton, Ontario NOM 1L0; Eric Russell, (519) 482-9429



CTG, 450 Chemin de la Grand Ligne, Granby, Quebec; (514) 358-4419



CTL, 495 Industriel, Longueuil, Quebec; (514) 358-4419



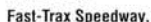
Dustkickers R/C Raceway, 1785 Cypress Rd., Quesnel, British Columbia V2J 4B1; Darrell Dinsdale, (250) 747-2680



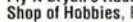
Dynamic Hobbies, 21 Concourse Gate, Unit 6, Nepean, Ontario, K2E7S40; Clark Freeman, (613) 225-9634



East Coast Model Center Raceway, 13 Glen Stewart Dr., Ste 1, Southport, Prince Edward Island C1A 8X9 Gary Stephen, (902) 569-3262



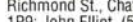
Evolution Speedway, 1935 Glengrove Rd., Pickering, Ontario L1V 1X3; Eric Lang, (905) 839-2084



Fast-Trax Speedway, RR 4, Trenton, Ontario; Russ McPeak, (613) 394-6411



Fly'n Bryan's Radical Raceway & Little Shop of Hobbies, RR #1, Ste. 12, Comp. 49, Chase, British Columbia, Canada V0E 1M0; Bryan Coffey/ Dani Potvin, (604) 955-0669



Gilles Comtois, 1458, boul. Lafleche, Baile-Comeau, Quebec, G5C 1E1; (418) 295-1830



Honda House Motor Speedway, 384 Richmond St., Chatham, Ontario N7M 1P9; John Elliott, (519) 354-5530



Interior R/C Raceway, 34-1605 Summit Dr., Kamloops, BC, V2E 2A5; Martin Vannieuwenhuizen, (604) 374-1268 or (604) 374-8458



J-T International Raceway, 127 Milligan Lane, Nanapan, Ontario K7R 8A1; N. O'Neill, (613) 354-0099



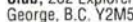
Leading Edge R/C Speedway, 731 Gardiners Rd., Kingston, Ontario K7M 3Y5, Canada; Mike and Tony Daicar, (613) 389-4878



Mid-Canada R/C Speedway, 1678 St. James St., Winnipeg, Manitoba R3H 0L3; Richard Driedger, (204) 339-6566



Miniatures & Passions, 204 St. Charles, #103, Ste. Therese, Quebec, Canada J7E 2 B4; Gilles Lachance, (514) 979-7989



MORRAC Raceway, 6449 Crowchild Tr. SW., Box 36060, Calgary, Alberta T3E 7C8; (403) 254-1386



Off-Road R/C Raceway, 76 Eddystone Ave., North York, Ontario M2N 1H4; Ron Lefebvre, (416) 740-0536

Quintrax Speedway, 610 Dundas St. East, Belleville, Ontario K7K 2M1; (613) 962-1414; fax (613) 962-7306



Randy Shantz Raceway, 1015 W. 14th St., North Vancouver, British Columbia; Steve Mulhall, (604) 945-3888



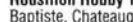
R/C Champ Raceway, 670 Progress Ave., Rear Unit #13-16; Scarborough, Ontario, M1H 3A4; Ben, Matthew or Louie (416) 289-8717



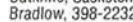
Recreation R/C Raceway, Hwy 16 and Ferry Ave., Prince George, BC; Doug Waller, (604) 561-0035



Ronbo's R/C Racing, RR 1 Glen Walter, Cornwall, Ontario K6H 3G4 Ron Giroux, (613) 936-0176



Rousillon Hobby Track, 177-D St-Jean Baptiste, Chateaugay, Quebec J6K 3B4; (514) 698-2151



Sheldon's Raceway, Box 597, Cutknife, Saskatchewan; Sheldon Bradlow, 298-2232



Spinnin Wheel Raceway, RR 1, Ariss, Ontario NOB 1B0; (519) 824-1614



South Okanagan Roadhogs, Skha Lake Rd., Penticton, BC; Willie Lemm, (604) 492-5698



Steeltown Speedway, 3580 Kirk Road West, Binbrook, Ontario L0R 1C0; Paul Snyder, (905) 227-7508



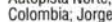
Strathclair Park, Old Garden River Rd., Sault Ste. Marie, Ontario P6A 5T1; (705) 759-1855



Sudbury Organized Auto Racing, 765 Barrydowne Rd., Sudbury, Ontario P3A 3T6; Ken Moore, (705) 524-5339



Thunder Alley Raceway, Lambton Mall, 1380 London Rd., Sarnia, Ontario N7S 1P8; Rob Smith, (519) 882-3361



Vancouver R/C Road Racers, #100-2733 Barney Hwy., Coquitlam, British Columbia V3E1K9; Roger Brown, (604) 945-3888



COLOMBIA

Club De Automodelismo Colombiano, Centro Recreativo Calam, Kilometro 14 Autopista Norte, Santafe De Bogota, D.C. Colombia; Jorge Delgado, 1-6130588



Club De Automodelismo Colombiano, Centro Comercial Guaymaral, Kilometro 16 Autopista Norte, Santafe De Bogota, D.C. Colombia; Jorge Delgado, 1-6130588



Garoso Raceway, Avenida Libertadores con Diagonal Gran Colombia, Cucuta, Colombia; Gabriel Rodriguez, 975-751892



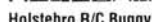
CYPRUS

Racing Model Club, Kennedy Ave. N. 42, Nicosia, Cyprus; Andrea Sotiriou, 493186; fax 493229

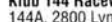


DENMARK

Brondby Motor Club, Roskildevej 460 Brondby, Denmark 2605; Soren Boy Holst, 45-36-472-462



Holstebro R/C Buggy Club, Mozartsvej 7500 Holstebro, Denmark 2600; Michael Brusholt, 45-97-412-734



Klub 144 Raceway, Bagsvaerdvej 144A, 2800 Lyngby, Denmark; Henrik Carstens, 45-42-88-3691



Rainbow Raceway, Eriksvej, 9 Glostrup, Copenhagen 2600; P. Christiansen, 45-52-848-504



Thor Minirace Odense, Sohusevej 255, Alsø, Odense, Behind Alesso Hallen (Sport Center), Odense, Denmark; Ulrich Rasmussen, 45-65-303-707



DOMINICAN REP.

Adoca R/C Speedway, Feria Canadara, Santo Domingo; (809) 220-5266



La Barranquita R/C International Speedway, Santiago; (809) 582-2303



ÉCUADOR

Hobby Centro A.C.R.O. Club, Via a Tur K O.S., Cuenca-Ecuador, Teddy Jaramillo, 593-7-831-289; fax 593-7-817082



ENGLAND

Chessington Radio Car Club, Surbiton Sport Club, Riverhill Estate, Worcester Park Rd., Worcester Park, Surrey; Ian Spiller, 0252-20657



Hampshire Racing Center, Viables Craft Center, Basingstoke, Hampshire; Tony Eudola 44-1276-61402



Hinckley RCCC, Three Pots Inn, A5 Wathing St., Hinckley, Leicestershire; Bruce, 0

HONDURAS

Autodromo Accion, Quinta Santa Maria, San Pedro Sula, Honduras, Colonia Rivera Hernandez; Eduardo Hondal, (504) 52-2061

HONG KONG

H.K.R.C. Model Car Racing Club, Lot 2130-2137, Ko Po Tsuen, Sha Tau Kok Rd., N.T., Hong Kong; Alex Chan, (852) 659-2822

Kingsville Buggy Arena, Wong Chuk Yeung Village, Shatin, N.T.; Pak Yeung, (852) 607-0828

INDONESIA

1st Circuit, Kompleks Villa, Kalijuduh Indah, Surabaya; 62-31-5681965

Cipaku Indah Speedway, J1 Cipaku Indah II/2, Bandung 40143, Indonesia; Cipaku Indah Hotel, Brad Lake, 62-22-210219

Karinda Off-Road R/C Car Model Circuit, Perumahan Bumi Karang Indah, J1 Karang tengah Rayam lebak bulus, Jakarta-Selatan 12440; Wiwid W. Soedarmadi, 62-21-7900878

Pondok Cabecircut, J.L. Kunir No. 83, Pondok Cabe, Ciputat, Jakarta, Indonesia; Ali Agus Salim, 7403568-9; fax 7491533

Sentul World Hobbies, Citeureup Bogo Jawa Barat, Indonesia; International Circuit Hilton Hartanto, Ian Sentul International Sirkuit, KM 42 62-21-751-2439

ISRAEL

Ircra Off-Road, Rahanana, Israel; Yaron Zafiris, (972) 030549937

Nahshoneat, Abba Nili Silver Str. 64, Haifa, Israel 32809; Golan Levy, (972) 039386444 or (972) 04231252

ITALY

Associazione Modellisti Cossato, via P. Maffei, Cossato 13014, Biella, Italy; Zanellato Romildo, 015-405881; fax 015-922709

JAPAN

Courtney Off-Road, Camp S.D. Butler, Okinawa, Japan, FPO AP 96379; USMC Arts & Crafts, 81-61173-53674

Foster R/C Raceway, Camp S.D. Butler, Okinawa, Japan, FPO AP 96379; Camp Foster Arts & Crafts, 81-61173-53674

Hansen Off-Road, Camp S.D. Butler, Okinawa, Japan, FPO AP 96379; USMC Arts & Crafts, 81-61173-53674

Iwakuni R/C Track, PSC 561, Box 978, FPO AP 96310-0978; David T. Eck, 81-6117-53-3662

Misawa APO Raceway, PSC 76, Box 2946, APO AP 96139-2946; Terry Brancheau, 81-7653-5181 ext. 222-5324

Yokota R/C Racers, PSC #78, Box 4274 APO AP 96326, Tokyo, Japan; Brad Johnson, 011-813-11-757-7655

Zama Off-Road Raceway, 17th ASGCM Unit 45013, Box 3232, APO AP 96338 Japan; SFC Ken Campbell, 81-3117-63-8478

KUWAIT

Inferno DX 4WD Track, P.O. Box 9167, Ahadi, Kuwait 61002; Yousuf Acqatari

LEBANON

Wild Willy R/C, Oscar St-Jal Eddie, Beirut, Lebanon; 00961-1-403751

MALAYSIA

Titwangsa Raceway, Lot 128, Ampang Park, Shopping Centre, Jalan, Ampang, Kuala Lumpur, Malaysia 50450; R.A.C.E. Sdn Bhd., 03-2614496

Jump Square Arena, Al21, SG, Buloh N/A, 47000, SG, Buloh, Selanhor, Malaysia; Thomson Chong, (603) 656-2513

MEXICO

Alces Off Road, Lopez Mateos y Rayod S/N, Ensenada, Baja California, BC 22830, Jorge Bustamante, 667-6-1476, 61477, 86729

Baja Jr., H. Valdez 151 Pte. Y Gmo. Prieto, Los Mochis Sinaloa 81200; Memo Asencio, Gaby Macias, 681-20276; fax 681-26430

Club Kyosho de Automodelismo Departino, Av. Pacifico 216 Coyoacan; Ajusco-Toluca Km 15.3 DE, Mexico 04330, Ing. Jorge Perez Holder, 525-544-08096; fax 525-544-7133

Cinamo Coca-Cola, Ruiz Cortines 620 Col. Central de Carga, Guadalupe, Nuevo Leon 67120; Sergio Garza, 83-35-70-0979-32-33

Hobby Centro, 12 De Diciembre No. 3070-A, Guadalajara, JAL 45550; Alejandro Ortiz Del Toro, 36-21-46-28

Hobby's Formula, Au observatorio 457 DF 01120; 905-502-3620

Hobby Model's Raceway, Blvd. Garcia de Leon, 1555, Morellid, Michoacan 58260; 431-5-01-22

Jaguar R/C Club, Calz. Zavaleta 116, Puebla 72150; Chema, Denise or Chiro, 22-31-00-91, 22-33-00-94

La Hielera, Prol Corregidora Nte 350, Queretaro, QRO C.P. 76160; Jorge Morelos Rabell, 42-12-15-25

Pista Casino, Hotel Casino de la Selva, Cuernavaca, Morelos 16507; Luis Duhart, 73-19-12-38

R/C Racing Club, Obsidiana #2900, Zapopan, Jalisco 44560; Fernando Hernandez, 3-616-73-47

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Nitro or electric? Chris helps you decide!

Now that you've read the "Nitro vs. Electric" article by my capable compatriot Steve Pond ... you *have* read Steve's article, haven't you? I know ... I know; you noble readers have once again turned to "Back Lot" first. I'm eternally grateful, but I humbly ask you to read Steve's article now. I'll still be here when you return. I promise.

OK; now that you've read Steve's article, you think you have it all figured out, don't you? I can just hear you guys now: "I'm a nitro man!" "Electric is for me!" Then, of course, the renaissance racers are spouting: "Nitro or electric; makes no difference. I'm good at anything I try!" Now, far be it from me to question

the capabilities of anyone. As far as I'm concerned, you're all renaissance racers and capable of doing whatever you want once you've set your mind to it. Most of us, however—me included—are not honest with ourselves 100 percent of the time. Our modeling zeal often clouds our vision concerning some important issues. With that in mind, I've come up with this little physiological/environmental test to help clear things up a bit. I hope a ray or two of reality will shine on your brains and help you make a more pragmatic decision on whether nitro or electric—or both—is best for the world you live in—and the one you create in your head*. Simply check A or B, both, or none.

*Test-result accuracy increases as thought decreases.



1 Are your neighbors the type who:

- ☐ A. Play ACDC at full blast till 1 a.m.
- ☐ B. Complain that "those noisy earthworms" are depriving them of sleep.

2 When feeling particularly giddy do you:

- ☐ A. Play R/C sandpiper by dodging the ocean's surf with your car.
- ☐ B. Run your car through a field of gone-to-seed dandelions to make "summer snow."

3 To kill time when filling up a car (full-scale) with gasoline, do you:

- ☐ A. Play a pocket video game.
- ☐ B. Play with matches.

4 Your favorite movies are:

- ☐ A. "LeMans," "American Graffiti."
- ☐ B. "Lawnmower Man," "Tron."

5 The result of your post-cleaning bedroom inspection is:

- ☐ A. You are joyfully driven to the racetrack with an unexpected extra 10 bucks in your pocket and sent off with a "Have a good time, darling."

- ☐ B. You're grounded for a week because the half dozen cheesy socks you stuffed under the mattress and the half-eaten can of SpaghettiOs in the dresser drawer (now green and fuzzy) were discovered.

6 Your favorite band is:

- ☐ A. Motorhead.
- ☐ B. Prodigy.

7 When you daydream, is it about:

- ☐ A. Rescuing endangered whales by blasting illegal whaling ships out of existence with a supercharged, 12-cylinder-Merlin-engine-powered North American P-51 Mustang.
- ☐ B. Discovering the secret to life (and subsequent peace on earth) by interfacing your Radio Shack laptop computer with the living brain of Flipper, which is in turn interfaced with a pyramid-shaped quartz crystal.

ready to spend time on a bit of post-race cleaning and maintenance after each day at the track, expect your expensive nitro engine to deteriorate into a useless piece of corroded metal in no time at all. You should stick with electric. If you answered "A," you're ready for nitro; if you decided on "B" and still want to run nitro, clean up your act!

6. Don't know about her music, but Natalie Emburglia sure is pretty.

7. There really isn't a correct answer. Just ask yourself: "What do I enjoy more, and what comes more naturally? Am I better at making excellent solder joints or tweaking needle valves?" Answer honestly! Moreover, the question isn't "Which is better?" One simply is NOT better than the other. It's what you like that's most important! Don't let anyone tell you what you should be enjoying. You're the boss in your world. Case closed.

picked "B," you'll be glad studies have shown that ESCs aren't affected by dandelion fuzz.

3. Nothing to laugh about here. Just as with gasoline, alcohol must be treated with the utmost respect and precautionary measures—especially because it burns with an invisible flame. Although it isn't quite as volatile as gasoline, treat it as though it were.

4. My favorites are: "Braveheart," "The Big Blue." If you checked "A" OR "B," you don't know a good movie from a bad hair day.

5. OK; nitro, in certain respects, does represent "the next step" in R/C. When you've finished running your nitro car for the day, you shouldn't throw it into the corner like a baseball glove (this is you guys who chose "B"). With an electric car, you can get away with this behavior on a limited basis—if you're lucky. If, however, you aren't

I know some of these questions may seem a bit out there, but wait till you hear the answers. You ain't seen nothin' yet! Seriously, there are a few hidden gems that will make your selection easier and will max out your modeling enjoyment.

1. Nitro-powered R/C car engines are quieter than ever, but you do have to consider others, especially if you live in a highly populated area. If you live near some pain who's bothered by everything, it's best to have an electric car to run at home, and you should save the nitro inspiration for the track. If you checked "A," it's time to get back at those people.

2. Most of you guys insist on running your cars in or near mud, snow and everything else. Though receivers can always be tightly sealed, electronic speed controls can't be because they need air cooling. ESCs hate water, especially of the salty variety. If you checked "A," stick with gas; if you

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